

Undergraduate Curriculum Committee Minutes

November 07, 2018

Ginger Hall 201

3:00 – 4:00 p.m.

PLEASE NOTE: All proposals approved by the Undergraduate Curriculum Committee are sent to the Provost for final approval.

Members Voting Online: Julia Finch, Morgan Getchell, Dirk Grupe, Flint Harrelson, Julia Ann Hypes, Nilesh Joshi, Tom Kmetz, and Shane Shope

Nilesh Joshi (first responder) made the motion to accept all online proposals.

Members Present at Meeting: Laurie Couch, Julia Finch, Morgan Getchell, Dirk Grupe, Flint Harrelson, Julia Ann Hypes, Nilesh Joshi (email votes) and Tom Kmetz

Guests: Eric Jerde

There was an introduction of committee members and guests at the beginning of the meeting.

1. Minutes (online voting)
 - October 03, 2018 – *approved*
2. Minor Revision to Existing Course (online voting)
 - EEC 400 Digital Signal Processing I – *approved*
 - SSE 340 Digital Control Systems for Space Applications – *approved*
 - SSE 360 Advanced Space Systems – *approved*
 - SSE 442 RF/Microwave Systems and Antennas – *pulled from online voting*
 - SSE 444 Satellite Communications – *pulled from online voting*
 - SSE 445 Space Systems Communications Lab – *pulled from online voting*
3. Minor Revision to Existing Program (online voting)
 - Engineering Technology Area Bachelor of Science – *approved*
4. Minor Revision to Existing Minor
 - None
5. New Course or Major Revision to Existing Course (online voting)
 - ETM 317 Systems Modeling and Simulation – *approved*
 - ETM 319 Quality and Reliability Engineering – *approved*
 - SSE 370 Flight Software Systems – *approved*
6. Course Deletion/Suspension/Reinstatement (online voting)
 - None
7. Program or Minor or Certificate Deletion/Reinstatement (online voting)
 - Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track – *approved*
 - Economics Minor – *approved*
 - Literature Minor – *approved*

FACE-TO-FACE VOTING:

1. Experimental Course
 - None
2. Creation of a Minor or Certificate
 - None
3. Major Revision of a Minor or Certificate

- None
4. Major Revision of an Existing Program
- Biomedical Sciences Area
 - Laurie explained that this proposal was to revise some language related to Math that was missed in a previous proposal. This is a correction to the previous proposal.
 - Flint questioned the BIOL 443 course being included in the list of electives (BIOL 210 is a pre-requisite and is not a required course). Laurie indicated that she approved this going forward because they had such a large list of electives to choose from, and there were multiple free electives to allow a student to take the pre-requisite if they wanted to take the BIOL 443 course.
 - Dirk Grupe made the motion to approve; Julia Ann Hypes seconded the motion. *The UGCC voted and the motion approved.*
5. New Program Proposal
- Space Systems Engineering
 - Laurie Couch provided some background information related to the curriculum process for this proposal. She indicated that the primary objective for this proposal is to move the current Space Science program from a Physics to an Engineering CIP code. The original approved proposal for the Space Science program used the Physics CIP code. Because the two programs share the same CIP code, the Council for Postsecondary Education (CPE) has indicated the only way to separate the two would be to complete the new program proposal process. If the Space Systems Engineering proposal is approved, the current Space Science program could be closed. **However, the closure can't happen until the revised program is completely through every approval process.**
 - Flint Harrelson questioned why the program was originally proposed with a Physics CIP code.
 - Eric Jerde indicated that the Department of Physical Sciences proposed the Space Science (SS) program, and this was a logical place since there was so much Physics involved. In 2008, the Department of Physical Sciences was disassembled and Space Science became Earth and Space Science (ESS) and moved across campus. The CIP code followed them. Astrophysics is in the ESS department, but is a track within the Math and Physics curriculum.
 - Laurie Couch indicated that it is something that we always have to keep track of because it is located in SS, but is tied to Physics on paper.
 - Eric Jerde has indicated that it has been a process to disaggregate the data for APNA, and that the SS program has evolved from what it was originally.
 - Dirk Grupe indicated that the Space Science program had gone through curriculum changes (such as adding Chemistry) 2-3 years ago.
 - Laurie Couch stated that Dr. Morgan announced the Space Science change to an engineering program at convocation. That started a chain reaction of events. To follow the CPE process, we had to submit this as a new program, which is a lengthy process. Eric had to first develop a Notification of Intent, which went to CPE and all of the Chief Academic Officers for review. During this step, objections to the new program could be raised, and that could have easily happened. There is a history in our state of current engineering programs opposing the development of engineering programs at other institutions. However, this step went smoothly, so the next step was the development of a **pre-proposal for CPE's** review. This step provides an opportunity for public comment, including other universities. If the university decides to complete the next step, it means that their curriculum process has approved the pre-proposal (that we are considering today). Once through the pre-proposal process, we post a full proposal, which **goes to CPE's Board. For us to get** the proposal to that point, it has gone through the department, college, and university level. If it passes today, the next step is the Provost, the President, and then the MSU Board of Regents. The timeline requires that this be on the agenda for Board's meeting in December. If they approve it, the next stop is to CPE for their March 2019 agenda, with their second

reading in May. Simultaneously, it goes to SACSCOC in January for their consideration in June/July. It must be approved at every level for it to go in the catalog in August.

- o Dirk Grupe commented that they were making these changes primarily for the students. Current students have been screened out when they apply for jobs in the space industry because they have a physics degree and not an engineering degree since the space industry requires an engineering degree. This program really is an engineering degree. It is also much easier when we are recruiting to be able to tell students that it is an engineering degree.
- o Eric Jerde indicated that some of the motivation was to get in the same CIP code **as the Master's Space Systems Engineering** program. It had always been the intention to do the ABET accreditation of the **Master's** program. In the spring of 2018, the Secretary of Economic Development from Frankfort visited our facilities and indicated that he wanted to see the number of engineering graduates double or triple at the University of Kentucky, the University of Louisville, and the Space Science Center. We thought that based upon his comment, this might be the time to request a change. Last year, we attempted to create a new course, which would require a simultaneous program change. When we submitted the proposals, they were approved through the department and college curriculum committees, but were rejected by the Office of Undergraduate Education and Student Success due to hidden pre-requisites in the program proposal. There was not enough time to route the clean-up proposals through the process before the curriculum cycle ended. Now, with the impetus to change the CIP code, we also had the pre-requisite clean up to address. This time, we ran into some controversy at the college level with the new course, even though it had been approved last year. We compromised and added a physics course in the program. At the same time, since we plan to go to accreditation with ABET, we looked at their requirements for Astronautical Engineering programs. While I say in the narrative this is essentially the same program we always had, there are a couple **of changes to align us with accreditation so that we don't have to come through** this process again two years from now.

Eric explained that the Space Science Center was not attached to his department, and he did not have any faculty in his department. He does liaise with the **Center's staff to teach the courses**. He also explained that the curriculum map with the proposal was in essence the same as the current Space Science program. There are a few minor changes to courses, but he had spoken Duane Skaggs and Chris Schroeder, who actually suggested some of the changes. ETM 307 is there instead of SSE 380 because the instructor is now in that school, and is the only credentialed instructor currently available to teach the course.

- o Tom Kmetz asked why the library questions were not on the new program proposal form. He felt the forms **were inadequate and did not meet the Library's** needs. Laurie explained that the new program proposal form was the **CPE's** template and we were not able to change it.
- o Julia Ann Hypes questioned whether the Bachelor of Science in Engineering degree designation was appropriate. During discussion, Laurie Couch stated that we only have certain degree names that we can use, and this list is governed by the CPE. She explained that Bachelor of Science in Engineering (BSE) is a degree designation, just as Bachelor of Science (BS) is a degree designation. The actual degree name will be Space Systems Engineering Area, Bachelor of Science in Engineering, which will be on the diploma and is transcribed.
- o **Flint questioned whether the fact that there were no "official"** instructors in that department would affect the ability to get ABET certification.

- Eric said that they didn't know the answer to that question yet, but he and Laurie had begun discussions about it. He indicated that they currently run into issues with credentialing since some of the staff do not have a terminal degree. They are required to develop an exceptional expertise certification for them, and are trying to work through this process. There is no change to what they are teaching with this proposal.
- Julia Ann Hypes questioned whether this was unique to Morehead State University.
- Eric indicated that other research universities do this, but a regional comprehensive runs into issues. He said that this was something that was going to have to be addressed and they would continue to work toward resolution.
- Dirk Grupe indicated that he thought the program would need new faculty lines, but this issue would have to be discussed with and approved by the Provost and President.
- Flint questioned why there is a new engineering program in the College of Science when there is an engineering program in the College of Business and Technology.
- Eric explained that Erin Thompson (CPE) had stated that the key thing with engineering program accreditation is that they be calculus based. Engineering Technology is not calculus based.
- Flint Harrelson said that he saw they had 120 majors (students) and then only had 8 degrees conferred. He questioned whether students were being stuck somewhere in the curriculum.
- Eric confirmed that students were having problems with Engineering Physics I and Engineering Physics II. He said they were getting about 40-45 new majors each fall. Students do not really understand the **program's requirements**, and many of them drop out and go to the Engineering Technology program. The department is considering some type of admission requirements for the program. He indicated that this was a known issue that they continue to work on.
- Julia Ann Hypes made a motion to approve the proposal; Dirk Grupe seconded the motion. *The UGCC voted and the motion was approved.*

6. Face-to-Face Proposals pulled from Online Voting

- SSE 442 RF/Microwave Systems and Antennas
- SSE 444 Satellite Communications
- SSE 445 Space Systems Communications Lab
- SSE 442 and SSE 445 was pulled from online voting due to the language discrepancy related to the PHYS 211 course.
- SSE 445 indicates, "**The** PHYS 211 is never taught and is not required by programs in the Department of Math and Physics."
- Eric explained that this was on the original proposal that was submitted to the college committee. At that meeting, there was a request to revise the pre-requisite to include PHYS 211. This section's language was not revised. Eric will revise the proposal to remove the above sentence.

- Laurie indicated that Chris Schoeder was contacted and we have correspondence (attached to the official proposal) that they are aware of the requirement and the department intends to teach PHYS 211 at least once per year.
- With these actions, there would be no need for any change to SSE 442.
- SSE 444 was pulled from online voting due to the course being equated with EEC 444 and no proposal submitted for EEC 444.
- Laurie indicated that Eric had discussions with Ahmad Zargari regarding the equation and changes to the pre-requisites. Rather than removing the EEC 344 pre-requisite (as originally proposed), the proposal will now contain EEC 344 OR SSE 442 as pre-requisites and the course will be equated with EEC 444. Because this was a change to the proposal that you received (SSE 442), we have emails (attached to the official document) stating that the revisions were approved at every level. We also have an unsigned EEC 444 proposal for the equation and notification that the signatures for EEC 444 will reach our office soon.
- Tom Kmetz moved that all three courses be approved pending receipt of the signatures for the EEC 444 proposal. Julia Ann Hypes seconded the motion. The UGCC voted and they were approved pending receipt of the EEC 444 signed proposal.

New Business:

- Laurie and Mike Henson have begun preparing our description of the curriculum process as part of our upcoming SACSCOC reaffirmation. Based on this work, it is clear that our discussions about curriculum proposals will need to go deeper in terms of considering program coherence and design, and our forms and minutes should **support the committee's deeper consideration of proposals as well. As such, when the new curriculum cycle begins in January we expect to make minor changes to our processes and procedures that will support this effort.**
- Tom Kmetz questioned if they made recommendations to curriculum ten years ago.
- Laurie said they had many comments about general education but was uncertain about other curriculum. The standards have changed since then as well.
- Laurie Couch indicated that the work of the committee, at every level (department/college), might change, with longer meetings being required. Every level would need to keep minutes, and we would need a repository for those minutes.
- It is also clear that there is a need to have an administrative regulation that defines a program, and states things like coherence as part of the program. She will be working with the Provost to develop this over the next few weeks.

Next Scheduled Meeting
December 05, 2018



COURSE
Minor Revision to an Existing Course
Undergraduate Curriculum Routing Form
 Revised September 2016

Course:	SSE 340 - Digital Control Systems for Space Applications
Department:	Earth and Space Sciences
College	Science

Signatures

ERIC JERDE <i>Eric Jerde</i>		10/10/18
Originator (Print and Sign)		Date
Thomas Pannuti <i>Thomas Pannuti</i>	<input type="checkbox"/> Approved () Disapproved	10/15/18
Departmental Curriculum Committee Approval (Print and Sign)		Date
ERIC JERDE <i>Eric Jerde</i>	<input checked="" type="checkbox"/> Approved () Disapproved	10/15/18
Department Chair's Approval (Print and Sign)		Date
DIRK GRUPE <i>Dirk Grupe</i>	<input checked="" type="checkbox"/> Approved () Disapproved	2018-Oct-23
College Curriculum Committee Approval (Print and Sign)		Date
Wayne Miller <i>Wayne Miller</i>	<input checked="" type="checkbox"/> Approved () Disapproved	10/23/2018
Dean's Approval (Print and Sign)		Date
N/A	() Approved () Disapproved	
Teacher Ed. Council Approval (if appropriate) (Print and Sign)		Date
Laurie Couch <i>Laurie Couch</i>	<input checked="" type="checkbox"/> Approved () Disapproved	11/07/18
Undergraduate Curriculum Committee Action (Print and Sign)		Date
Bob <i>Bob</i>	<input checked="" type="checkbox"/> Approved () Disapproved	11-9-18
Vice President for Academic Affairs (Print and Sign)		Date

For Academic Programs Office Use Only

Date proposal received in Academic Programs Office: _____

Date Academic Programs notified SAC's Liaison: _____

Deleted Program Suspension Date: _____ Final Program Deletion Date: _____

SACS Response: Approved Denied Revision Required SAC's Response Date: _____

Date Academic Programs notified of SAC's Response: _____ CPE Notification Date: _____

COURSE

Minor Revision to an Existing Course

I. COURSE

This outline is to be used to report a minor modification (e.g., title, prefix, course number, catalog course description, minor admission or completion requirements, equate a current course with a new course) of previously approved courses. *Minor changes do not modify course content.* If the course content or formula is to be modified, use the New Course or Major Revision to Existing Course Form. Terms offered should be consistent with the curriculum map.

Current Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
	SSE	340			
Proposed Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
	SSE	340			

List departments and programs that could be impacted by this proposal.

None. MATH 275 (which has a prerequisite of MATH 175) is already taken by by this point in the curriculum, so the MATH 175 requirement is redundant.

List the individuals notified by the proposing department chair and define the method of contact (e-mail, phone conversation, etc.)

N/A

II. JUSTIFICATION:

Supply justification for the change and describe briefly what this proposal is requesting. (What are you doing and why are you doing it?)

The current pre-requisites listed include SSE 105, SSE 122, MATH 175, and PHYS 211. MATH 275 is already taken by this point in the curriculum, so the prerequisite of MATH 175 is redundant. MATH 175 is being removed as a prerequisite, and PHYS 211 will be changed to a corequisite.

III. ADDITIONAL INFORMATION

If this is a change that affects the current MSU Undergraduate Catalog content, please provide the verbiage as you would like for it to appear in the MSU Undergraduate catalog.

There are no changes to the course description. The prerequisites should be revised as follows:
 SSE 105 and SSE 122 must be completed prior to taking this course.
 PHYS 211 and SSE 340L must be taken at the same time as this course.



COURSE
Minor Revision to an Existing Course
Undergraduate Curriculum Routing Form
 Revised September 2016

Course:	SSE 360 - Advanced Space Systems
Department:	Earth and Space Sciences
College	Science

Signatures

ERIC JERDE <i>Eric Jerde</i>		10/10/18
Originator (Print and Sign)		Date
<i>Thomas Pannuti</i> <i>Thomas Pannuti</i>	<input checked="" type="checkbox"/> Approved () Disapproved	10/15/18
Departmental Curriculum Committee Approval (Print and Sign)		Date
ERIC JERDE <i>Eric Jerde</i>	<input checked="" type="checkbox"/> Approved () Disapproved	10/15/18
Department Chair's Approval (Print and Sign)		Date
DIRK GROPE <i>Dirk Grope</i>	<input checked="" type="checkbox"/> Approved () Disapproved	2018-04-23
College Curriculum Committee Approval (Print and Sign)		Date
<i>Wayne Miller</i> <i>WAYNE MILLER</i>	<input checked="" type="checkbox"/> Approved () Disapproved	10/23/2018
Dean's Approval (Print and Sign)		Date
N/A	<input type="checkbox"/> Approved () Disapproved	
Teacher Ed. Council Approval (if appropriate) (Print and Sign)		Date
<i>Laurie Couch</i> <i>Laurie Couch</i>	<input checked="" type="checkbox"/> Approved () Disapproved	11/07/18
Undergraduate Curriculum Committee Action (Print and Sign)		Date
<i>BM</i>	<input checked="" type="checkbox"/> Approved () Disapproved	11/9/18
Vice President for Academic Affairs (Print and Sign)		Date

For Academic Programs Office Use Only	
Date proposal received in Academic Programs Office: _____	
Date Academic Programs notified SAC's Liaison: _____	
Deleted Program Suspension Date: _____	Final Program Deletion Date: _____
SACS Response: <input type="checkbox"/> Approved <input type="checkbox"/> Denied <input type="checkbox"/> Revision Required	SAC's Response Date: _____
Date Academic Programs notified of SAC's Response: _____	CPE Notification Date: _____

COURSE

Minor Revision to an Existing Course

I. COURSE

This outline is to be used to report a minor modification (e.g., title, prefix, course number, catalog course description, minor admission or completion requirements, equate a current course with a new course) of previously approved courses. *Minor changes do not modify course content.* If the course content or formula is to be modified, use the New Course or Major Revision to Existing Course Form. Terms offered should be consistent with the curriculum map.

Current Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
		SSE	360	Advanced Space Systems	3-0-3
Proposed Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
		SSE	360	Advanced Space Systems	3-0-3

List departments and programs that could be impacted by this proposal.

PHYS 270 is in the Department of Mathematics and Physics.

List the individuals notified by the proposing department chair and define the method of contact (e-mail, phone conversation, etc.)

Dr. Chris Schroeder, Chair of Mathematics and Physics was contacted via email.

II. JUSTIFICATION:

Supply justification for the change and describe briefly what this proposal is requesting. (What are you doing and why are you doing it?)

The current pre-requisites listed include SSE 340 and a corequisite of PHYS 270. PHYS 270 is being removed as a program requirement, so this course is no longer needed.

III. ADDITIONAL INFORMATION

If this is a change that affects the current MSU Undergraduate Catalog content, please provide the verbiage as you would like for it to appear in the MSU Undergraduate catalog.

There are no changes to the course description. The prerequisites should be revised as follows:
SSE 340 must be completed prior to taking this course.

COVER SHEET

This sheet (including the Checklist) MUST accompany the paper hard copy of the proposal that is routed through the signature process.

Course: (as listed in current catalog)	SSE 370 Flight Software Systems
Department: (as listed in current catalog)	Earth and Space Sciences
College: (as listed in current catalog)	Science

The proposal form language and formatting cannot be altered in any way. If the form has been altered, it will be returned to the initiator for revision.

Please note: it is the initiator's responsibility to track a proposal through the approval process.



The initiator will review the final document and complete the checkboxes on the left side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the Department Curriculum Committee Chair for their review.

The Department Curriculum Committee Chair will review the document and complete the checkboxes on the right side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the next level.

Initiator		Department Curriculum Committee Chair
<input checked="" type="checkbox"/>	The curriculum proposal form has not been altered (formatting, font, etc.).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	If an Information Technology signature is required, it has been obtained. <i>NA</i>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	If a Teacher Education Council signature is required, the next approval level will be notified so that it can be obtained. <i>NA</i>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Grammar, spelling, punctuation, sentence structure, etc. is accurate.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The course title, department, and college names correspond to the current catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Course teaching workload, formula, and semesters taught are specified.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The course description EXACTLY matches the course description stated in the syllabus.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The impacted departments, programs, the individuals notified, and the method of notification are listed.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Responses are complete and applicable for each question.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	If the course requires the use of live animals, the IACUC form is attached. <i>NA</i>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus starts on a separate page.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains a heading to reflect "Morehead State University" as well as college, school, and/or department.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the course title and course number (exactly as listed in the proposal).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the academic term with date.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the instructor's name.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the office location.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the instructor's office phone number and office hours schedule.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the email address and URL for the instructor's personal web site, if applicable.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the revised course description and it exactly matches the course description	<input checked="" type="checkbox"/>

<input checked="" type="checkbox"/>	on the proposal. If there is no revision to the course description, it exactly matches the course description in the current catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the intended student learning outcomes related to program objectives as specified in the catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the methods by which the achievement of each student learning outcome listed on the syllabus will be measured. List each activity and the assessment method for that activity.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	For example: 1. Students will write a term paper; scored by a rubric; or 2. Students will complete an exam; objective test.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains a week by week or day by day course calendar with specific content, assignments and/or exams highlighted.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains a grading description and distribution (please be very specific).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains a course attendance policy (please be very specific and ensure compliance with UAR 131.01).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the following Campus Safety Statement:	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<p>Campus Safety Statement Emergency response information will be discussed in class. Students should familiarize themselves with the nearest exit routes in the event evacuation becomes necessary. You should notify your instructor at the beginning of the semester if you have special needs or will require assistance during an emergency evacuation. Students should familiarize themselves with emergency response protocols at: http://www.moreheadstate.edu/emergency/</p>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<p>The syllabus contains the following academic honesty policy:</p> <p>Academic honesty: All students at Morehead State University are required to abide by accepted standards of academic honesty. Academic honesty includes doing one's own work, giving credit for the work of others, and using resources appropriately. Guidelines for dealing with acts of academic dishonesty can be found in the academic catalog.</p>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<p>The syllabus contains the following policy for accommodating students with disabilities:</p> <p>Americans with Disabilities Act (ADA) Students with disabilities are entitled to academic accommodations and services to support their access and safety. The Office for Disability Services in 109-J Enrollment Services Center coordinates reasonable accommodations for students with documented disabilities. Although a request may be made at any time, services are best applied when they are requested at or before the start of the semester. Please contact Disability Services at 606-783-5188 or e.day@moreheadstate.edu or visit their website at www.moreheadstate.edu/disability.</p>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The entire proposal is saved as one Word document.	<input checked="" type="checkbox"/>

My signature verifies that I have reviewed the proposal and it is ready to go to the next level.

ERIC JERDE		10/10/18
Originator (Sign and Print)		Approval Date
Thomas Pannuti		10/15/18
Department Curriculum Committee Chair (Sign and Print)		Approval Date

COURSE

New Course or Major Revision to Existing Course

This outline is to be used when a new course is proposed or when a major change is proposed to an existing course. If you are preparing a *new* experimental course/workshop proposal, please use the New Experimental Course/Workshop form. This outline is not to be used for General Education Courses. Refer to the General Education web site.

I. COURSE INFORMATION						
<ul style="list-style-type: none"> • The course title can only be 30 characters. • The following are definitions of terms related to courses: <ul style="list-style-type: none"> ▪ Petition required – requires permission from the Department Chair to enroll in a section of the course. ▪ Equated – two different courses with the same content at the same level with different prefixes. ▪ Restricted – program admission is required and/or must have Department Chair approval. ▪ Formula – (3-0-3) = instruction hours – lab hours – credit hours 						
This is a <input checked="" type="checkbox"/> New Course <input type="checkbox"/> Revised Course						
Course Name <small>(as listed in the current catalog)</small>	Course prefix <small>(Example: ENG)</small>	Number <small>(Example: 100)</small>	Title <small>(Example: Writing I)</small>	Formula <small>(Example: 3-0-3)</small>	Faculty Load <small>(Contact your Department Chair or Dean's Office for assistance)</small>	Intended Terms Offered <small>(Example: Fall/Spring)</small>
	SSE	370	Flight Software Systems	2-2-3	3.47	Spring
Approved major or program(s) in which the course will be offered. <small>(as listed in the current catalog)</small>						
Space Science Area						
This is a <input checked="" type="checkbox"/> required course. This is an <input type="checkbox"/> elective course.						
Course Description	Course description <i>exactly as it will appear in the catalog and as it appears on the sample syllabus.</i> Include pre-requisites/co-requisites, petition requirements, course equations, restrictions and term(s) offered. Example: XYZ 288. Guidelines for a New Course. (3-0-3) Fall and Spring; petition required. A study of the impact of technology on individuals, society, and the environment. Equated with RUL 288.					
	SSE 370. Flight Software Systems. (2-2-3). Pre-requisites: PHYS 232 and MATH 276. An in-depth presentation of the internals of core flight software running on a real-time operating system (LinuxRT). Covered in this course are operating system hardware and software details, threading, process scheduling, device drivers, and input/output details.					
II. PURPOSE, GOALS AND OBJECTIVES						
A. What are the goals and objectives of the proposal? Explain why you are proposing a new course or why and how you are revising a current course.						
After 60 years of spaceflight where every spacecraft has had its own unique flight software, the industry is now moving to the implementation of "core flight software" that provides coding for activities that are common to all spacecraft such as attitude control, power distribution, and communication, among others. This course will provide knowledge to use the core flight software modules that have been developed, and how to integrate it with software specific for the spacecraft being developed.						
B. Justify the proposed instructional level (100-600) or instructional level change.						
This course is an upper level course (SSE 370) that requires a full year of engineering physics and Calculus III, making it one that will be taken at the junior level.						
C. List the student learning outcomes for the course.						
Upon completion of the course the students will: <ol style="list-style-type: none"> 1. Be able to write C/C++ functions, modules, and libraries 2. Demonstrate that they know how to create and manage processes and threads 3. Be able to articulate the concepts of scheduling, real-time processes, and input/output (I/O) 4. Effectively use "Hardware Abstraction Layers" to communicate with I/O devices 5. Demonstrate an understanding of operating system components and utilities 6. Write applications for the Core Flight Software 						
D. Describe how those student learning outcomes will be assessed. List each activity and the assessment method for that activity. For example: 1. Students will write a term paper; scored by a rubric; or 2. Students will complete an exam; objective test.						
Item 1 will be assessed through homework and Project 1, which will be scored by a rubric; Item 2 will be assessed through homework and Project 2, which will be scored by a rubric; Item 3 will be assessed by Exam #1; Item 4 will be assessed through homework and Project 3, which will be scored by a rubric;						

Item 5 will be assessed by Exam #2;

Item 6 will be assessed through homework and Project 4, which will be scored by a rubric;

A comprehensive final exam will also cover aspects of all portions of the course.

E. Define how the course helps students to achieve learning objectives required for the program.

Since the flight software is the basic operating system of any spacecraft, this course provides essential knowledge relating to a fundamental subsystem. Such knowledge relates to the first two objectives of the program, namely

1. Develop basic competencies in system engineering and gain familiarity with the concepts and technologies associated with aerospace systems requirements, particularly spacecraft-related subsystems.
2. Learn how to use basic laboratory instrumentation and acquire skills that permit a rapid start in practical "real world" applications in the workplace.

F. Explain how the specific goals and objectives of the course relate to the mission statement of the University.

The goals of this course address the mission statement in two points. The development of flight software for specific spacecraft using the architecture of Core Flight Software fosters innovation, collaboration, and creative thinking. Because the Core Flight Software approach is beginning to be used universally, we are also educating students for success in a global environment.

III. IMPACT

A. List any existing course(s) that will be replaced by the proposed/revised course.

N/A

B. List the degree to which course duplicates or overlaps other courses now offered at MSU and justification for any duplication.

N/A

C. List departments and programs that could be impacted by this proposal. For example, any department that:

- a. Requires the course
- b. Has an equated course
- c. Shares staff and/or resources.

N/A

D. List the individuals notified by the proposing department chair and define the method of contact (e-mail, phone conversation, etc).

N/A

V. PERSONNEL

A. List names, qualifications including the highest earned degree, and academic rank(s), of faculty available to MSU who will teach the course.

Charles Conner, Ph.D., Staff Engineer

Kevin Brown, M.S., Staff Engineer

B. Identify external adjunct faculty, if appropriate.

N/A

V. ADDITIONAL INFORMATION

A. Desired section size and anticipated enrollment.

20 (anticipated 10 at start)

B. Desired implementation date for the course.

Spring 2020

C. Method of instruction (online, lecture, laboratory, individualized, etc.).

Lecture/Lab

D. Additional facilities and special equipment needs for this course, if any.

None

E. Use of library resources

It is recommended that you contact a library liaison prior to completing this section to determine what resources and services are available to support the course.

• Does the course require library resources to support specific class assignments or supplemental reading? Yes No

• Do the library services and resources presently available meet student needs for the course? Yes No

If not, what library acquisitions are being proposed to meet essential needs?

F. Does this course require new technology?

Please note that Information Technology (GH 110) should be notified when the course proposal is being developed. Early notification will allow IT an opportunity to provide quality information that can be included in the proposal request form.

Yes (If yes, you must have a representative from Information Technology review the proposal and sign the signature sheet.)

No

If yes, please list:

1. the software to be used and its estimated cost. If there is intent to utilize the software in a lab, include the estimated cost of the server-based license for the software. (IT does not install individual packages in labs, only server-based versions).

2. the type of hardware to be utilized.

G. Does this course involve the use of live animals? Yes No

If so, include the approval form from the associated Institutional Animal Care and Use Committee (IACUC).

H. Please include a sample syllabus (must start on new page). *All elements on the syllabus checklist must be included on the sample syllabus* (syllabus checklist attached).

- Proposals for all Teacher Education courses (including content courses that typically have 50% more teacher preparation majors enrolled) are required to go to the Teacher Education Committee as part of the curriculum approval process
- The teacher education syllabi must contain these elements: the theme for MSU's Teacher Education Program; CAEP* themes; any additional EPSB themes; and program appropriate Kentucky Teacher Standards (www.kyepsb.net/teacherprep/standards.asp). Further information and models are provided at <http://www.moreheadstate.edu/education/>.
- *The College of Education (CoE) is NCATE accredited. NCATE and TEAC have combined to form CAEP, a new national accrediting organization. Educator Preparation Programs, including the CoE at MSU are in the process of transitioning from NCATE to CAEP and as such, we are working to transition to align our programs with CAEP standards and requirements in anticipation of our next accreditation visit in 2018, at which time we will fall fully under CAEP standards and guidelines. For more information on CAEP and the new accreditation process, please see www.caepnet.org.

Morehead State University

College of Science

Department of Earth & Space Sciences

SSE 370 – Flight Software Systems

Spring 2020

Instructor: Charles Conner

Office: Space Science Center 212-F

Office Hours: M-F 1-2 pm

Office Phone: 783-2427

Main Office: 783-2381

e-mail: c.conner@moreheadstate.edu

Course Description: SSE 370. Flight Software Systems. (2-2-3). Pre-requisites: PHYS 232 and MATH 276. An in-depth presentation of the internals of core flight software running on a real-time operating system (LinuxRT). Covered in this course are operating system hardware and software details, threading, process scheduling, device drivers, and input/output details.

Grading

Your course grade will be based on the following:

Homework	10%
Exam #1	15%
Exam #2	15%
Final Exam	20%
Projects	40%

A	90 – 100%
B	80 – 89%
C	70 – 79%
D	60 – 69%
E	< 60%

Attendance:

- The instructor of this course requires that students attend all lecture/laboratory sessions for the full scheduled time of each session.
- The student is allowed three hours of unexcused absences.
- More than three unexcused absence hours results in a demotion of 1 letter grade for each additional class missed.
- No work can be made up due to an unexcused absence.

Should students need to miss class because of legitimate reasons as stated in the MSU catalog, the instructor must be consulted beforehand. Please refer to the official MSU policy for excused absences: UAR 131.02.

Assignments:

Homework assigned in class: in order to receive full credit, all work must be documented with formulas, methods, given values, diagrams, etc.

Homework assignments are due one week after they are assigned.

Midterm and Final Exams:

The exam material will be drawn from examples in the lecture, homework problems, and the projects. Occasionally, a problem will be presented which requires the student to extend the presented material (slightly). A detailed method for solving this problem may not be provided (and there may be several ways to solve the problem.) These types of problems are typical in practical engineering.

Objectives:

Upon completion of the course, the student will demonstrate understanding of the basic concepts used in the Core Flight Software system used in spacecraft operations. Specifically, the student will be able to:

1. Write C/C++ functions, modules, and libraries. Assessed through homework and Project 1, which will be scored by a rubric.
2. Demonstrate that they know how to create and manage processes and threads. Assessed through homework and Project 2, which will be scored by a rubric.
3. Articulate the concepts of scheduling, real-time processes, and input/output (I/O). Assessed by Exam #1.
4. Effectively use "Hardware Abstraction Layers" to communicate with I/O devices. Assessed through homework and Project 3m which will be scored by a rubric.
5. Demonstrate an understanding of operating system components and utilities. Assessed by Exam #2.
6. Write applications for the Core Flight Software. Assessed through homework and Project 4, which will be scored by a rubric.

A comprehensive final exam will cover aspects from the entire course.

Americans with Disabilities Act (ADA): Students with disabilities are entitled to academic accommodations and services to support their access and safety needs. The Office for Disability Services in 109-J Enrollment Services Center coordinates reasonable accommodations for students with documented disabilities. Although a request may be made at any time, services are best applied when they are requested at or before the start of the semester. Please contact Disability Services at 606-783-5188, e.day@moreheadstate.edu, or visit their website at www.moreheadstate.edu/disability for more information.

Campus Safety Statement: Emergency response information will be discussed in class. Students should familiarize themselves with the nearest exit routes in the event evacuation becomes necessary. You should notify your instructor at the beginning of the semester if you have special needs or will require assistance during an emergency evacuation. Students should familiarize themselves with emergency response protocols at <http://www.moreheadstate.edu/emergency>

Academic Honesty: Cheating, fabrication, plagiarism or helping others to commit these acts will not be tolerated. Academic dishonesty will result in severe disciplinary action including, but not limited to, failure of the student assessment item or course, and/or dismissal from MSU. If you are not sure what constitutes academic dishonesty, read The Eagle: Student Handbook or ask your instructor. The policy is located at <http://www.morehead-st.edu/units/studentlife/handbook/academicdishonesty.html>. For example: copying information from the Internet is plagiarism if appropriate credit is not given.

COURSE CALENDAR

Week	Topic	Chapter
1	Computer Architecture & Operating Systems	
2	Review of C++	
3	Review of C++	
4	Functions, Modules, and Libraries	Proj 1 due
5	Threads & Processes	
6	I/O, Drivers and Hardware Abstraction EXAM #1	
7	I/O, Drivers and Hardware Abstraction	
8	Operating Systems: Booting, Kernels, Consoles, Scripting and Utilities	Proj 2 due
9	Operating Systems: Booting, Kernels, Consoles, Scripting and Utilities	
10	Operating Systems: Booting, Kernels, Consoles, Scripting and Utilities EXAM #2	
11	Flight Software Functions	Proj 3 due
12	Flight Software Functions	
13	Core Flight Software	
14	Core Flight Software	
15	Core Flight Software	Proj 4 due
FINAL EXAM - Tuesday, May 6, 2020, 10:15 am		



COURSE
Minor Revision to an Existing Course
Undergraduate Curriculum Routing Form
 Revised September 2016

Course:	SSE 442 - RF/Microwave Systems and Antennas
Department:	Earth and Space Sciences
College	Science

Signatures

ERIC JERDE	<i>Eric Jerde</i>		10/10/18
Originator (Print and Sign)			Date
Thomas Pannuti	<i>Thomas Pannuti</i>	<input checked="" type="checkbox"/> Approved () Disapproved	10/15/18
Departmental Curriculum Committee Approval (Print and Sign)			Date
ERIC JERDE	<i>Eric Jerde</i>	<input checked="" type="checkbox"/> Approved () Disapproved	10/15/18
Department Chair's Approval (Print and Sign)			Date
DIRK GRUPE	<i>Dirk Grupe</i>	<input checked="" type="checkbox"/> Approved () Disapproved	2018-Oct-23
College Curriculum Committee Approval (Print and Sign)			Date
Wayne Miller	<i>Wayne Miller</i>	<input checked="" type="checkbox"/> Approved () Disapproved	10/23/2018
Dean's Approval (Print and Sign)			Date
N/A		() Approved () Disapproved	
Teacher Ed. Council Approval (if appropriate) (Print and Sign)			Date
Laurie Couch	<i>Laurie Couch</i>	<input checked="" type="checkbox"/> Approved () Disapproved	11/07/18
Undergraduate Curriculum Committee Action (Print and Sign)			Date
Bob AMM	<i>Bob AMM</i>	<input checked="" type="checkbox"/> Approved () Disapproved	11-9-18
Vice President for Academic Affairs (Print and Sign)			Date

For Academic Programs Office Use Only	
Date proposal received in Academic Programs Office: _____	
Date Academic Programs notified SAC's Liaison: _____	
Deleted Program Suspension Date: _____	Final Program Deletion Date: _____
SACS Response: <input type="checkbox"/> Approved <input type="checkbox"/> Denied <input type="checkbox"/> Revision Required	SAC's Response Date: _____
Date Academic Programs notified of SAC's Response: _____	CPE Notification Date: _____

COURSE

Minor Revision to an Existing Course

I. COURSE

This outline is to be used to report a minor modification (e.g., title, prefix, course number, catalog course description, minor admission or completion requirements, equate a current course with a new course) of previously approved courses. *Minor changes do not modify course content.* If the course content or formula is to be modified, use the New Course or Major Revision to Existing Course Form. Terms offered should be consistent with the curriculum map.

Current Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
	SSE	442			RF/Microwave Systems and Antennas
Proposed Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
	SSE	442			RF/Microwave Systems and Antennas

List departments and programs that could be impacted by this proposal.

EEC 342 and EEC 344 will still be required by programs within the School of Engineering and Technology Management, and it is likely that these courses would end up with fewer students.

List the individuals notified by the proposing department chair and define the method of contact (e-mail, phone conversation, etc.)

Dr. Ahmad Zargari, Associate Dean of the School of Engineering Technology and Management, has been notified of this proposal in person and by email.

II. JUSTIFICATION:

Supply justification for the change and describe briefly what this proposal is requesting. (What are you doing and why are you doing it?)

EEC 342 & EEC 344 should be removed as pre-requisites for this course and PHYS 211 needs to be added to the pre-requisites for this course.

III. ADDITIONAL INFORMATION

If this is a change that affects the current MSU Undergraduate Catalog content, please provide the verbiage as you would like for it to appear in the MSU Undergraduate catalog.

There are no changes to the course description or Corequisites. The prerequisites should be revised as follows: PHYS 232, PHYS 232A, and PHYS 211 must be completed prior to taking this course. Take SSE 442L must be taken at the same time as this course.

Sharri Lynn Jones

From: Eric Jerde
Sent: Friday, November 2, 2018 3:56 PM
To: Sharri Lynn Jones
Subject: SSE 442 changes

Sharri,

I have been in ongoing discussions with Chris Schroeder in Math & Physics about the changes in our program, which include the new requirement of PHYS 211 in our program. In the new Space System Engineering program, PHYS 211 is now a required course, and since it covers the material from EEC 342 & EEC 344, it is now added to the pre-reqs for SSE 442. The use of PHYS 211 in our program was suggested by Chris Schroeder, so he agrees with the change.

Eric Jerde



COURSE
Minor Revision to an Existing Course
Undergraduate Curriculum Routing Form
 Revised September 2016

Course:	SSE 445 - Space Systems Communications Lab
Department:	Earth and Space Sciences
College	Science

Signatures

ERIC JERDE <i>Eric Jerde</i>		10/10/18
Originator (Print and Sign)		Date
Thomas Pannuti <i>Thomas Pannuti</i>	<input checked="" type="checkbox"/> Approved () Disapproved	10/15/18
Departmental Curriculum Committee Approval (Print and Sign)		Date
ERIC JERDE <i>Eric Jerde</i>	<input checked="" type="checkbox"/> Approved () Disapproved	10/15/18
Department Chair's Approval (Print and Sign)		Date
DIRK GROPE <i>Dirk Grope</i>	<input checked="" type="checkbox"/> Approved () Disapproved	2018-Oct-23
College Curriculum Committee Approval (Print and Sign)		Date
Wayne Miller <i>WAYNE MILLER</i>	<input checked="" type="checkbox"/> Approved () Disapproved	10/23/2018
Dean's Approval (Print and Sign)		Date
N/A	() Approved () Disapproved	
Teacher Ed. Council Approval (if appropriate) (Print and Sign)		Date
Laurie Couch <i>Laurie Couch</i>	<input checked="" type="checkbox"/> Approved () Disapproved	11/07/18
Undergraduate Curriculum Committee Action (Print and Sign)		Date
<i>[Signature]</i>	<input checked="" type="checkbox"/> Approved () Disapproved	11-14-18
Vice President for Academic Affairs (Print and Sign)		Date

For Academic Programs Office Use Only

Date proposal received in Academic Programs Office: _____

Date Academic Programs notified SAC's Liaison: _____

Deleted Program Suspension Date: _____ Final Program Deletion Date: _____

SACS Response: Approved Denied Revision Required SAC's Response Date: _____

Date Academic Programs notified of SAC's Response: _____ CPE Notification Date: _____

COURSE

Minor Revision to an Existing Course

I. COURSE

This outline is to be used to report a minor modification (e.g., title, prefix, course number, catalog course description, minor admission or completion requirements, equate a current course with a new course) of previously approved courses. *Minor changes do not modify course content.* If the course content or formula is to be modified, use the New Course or Major Revision to Existing Course Form. Terms offered should be consistent with the curriculum map.

Current Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
	SSE	445	Space Systems Communications Lab	0-2-1	Spring
Proposed Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
	SSE	445	Space Systems Communications Lab	0-2-1	Spring

List departments and programs that could be impacted by this proposal.

None. The PHYS 211 listed as a prerequisite is never taught and is not required by programs in the Department of Mathematics and Physics. *See attached email.*

List the individuals notified by the proposing department chair and define the method of contact (e-mail, phone conversation, etc.)

N/A

II. JUSTIFICATION:

Supply justification for the change and describe briefly what this proposal is requesting. (What are you doing and why are you doing it?)

This lab is required for our majors to extend the experience of SSE 444/444L. Thus SSE 444 & 444L must be co-requisites. The current course lists prerequisites of SSE 122, PHYS 211, SSE 320, PHYS 232, and PHYS 232A as pre-requisites. These are redundant as they are required for SSE 442, which is the pre-requisite for SSE 444. As such, they are being removed as prerequisites.

III. ADDITIONAL INFORMATION

If this is a change that affects the current MSU Undergraduate Catalog content, please provide the verbiage as you would like for it to appear in the MSU Undergraduate catalog.

The prerequisites should be revised as follows:

SSE 442 must be taken prior to taking this course;

SSE 444 and SSE 444L must be taken at the same time as this course.

Sharri Lynn Jones

From: Christopher Schroeder
Sent: Monday, November 5, 2018 1:14 PM
To: Laurie L. Couch
Cc: Sharri Lynn Jones
Subject: PHYS 211 and SSE Program Proposal

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Laurie,

Dr. Jerde asked me to write you to let you know that we are fully aware of the PHYS 211 requirement as outlined in the new SSE program proposal and have agreed to teach the course as often as is necessary to keep up with demand for students in his program. In addition, we have agreed to work with faculty members in his department to let them teach the class on occasion to help ensure that the course will be offered sufficiently many times.

Please let me know if you have any questions, or if I can be of any further assistance.

Best,
Chris

Christopher Schroeder
Chair, Department of Mathematics and Physics
105A Lappin Hall
Morehead State University
606-783-2938
www.moreheadstate.edu/maph



PROGRAM
Major Revision of Existing Program
Undergraduate Curriculum Routing Form
 January 2018

Program: (as listed in current catalog)	Biomedical Sciences Area Bachelor of Science
Department: (as listed in current catalog)	Biology and Chemistry
College: (as listed in current catalog)	Science

The proposal form language and formatting cannot be altered in any way. If the form has been altered, it will be returned to the initiator for revision.

Please note: it is the initiator's responsibility to track a proposal through the approval process.

Signatures (Signatures must be handwritten; electronic signatures are not accepted.)

If question E1 or E2 in section IV is answered yes, then you (the initiator) must have a representative from Information Technology (GH 201) sign the signature sheet before it is submitted to the department curriculum committee.

N/A () Approved () Disapproved
 Information Technology Resources Are Available (Sign and Print) Date

The Departmental Curriculum Committee Chair will review and complete the checklist on the next page to indicate their approval.
 Departmental Curriculum Committee

Charles Lyderdy (X) Approved () Disapproved 10/10/18
 Department Chair or Associate Dean (Sign and Print) Date

Dirk Grube (X) Approved () Disapproved 2018-10-19
 College Curriculum Committee (Sign and Print) Date

Wayne Miller (X) Approved () Disapproved 10/20/2018
 Dean (Sign and Print) Date

N/A () Approved () Disapproved
 Teacher Ed. Council (if program is a secondary education program) (Sign and Print) Date

Once the proposal has been approved through the above levels, the initiator will route the FINAL paper document to Howell McDowell 204 and submit the FINAL electronic WORD document to undergraduate@moreheadstate.edu (the two documents must be exactly the same).

Laurie Couch (X) Approved () Disapproved 11/07/18
 Undergraduate Curriculum Committee (Sign and Print) Date

Bob [Signature] (X) Approved () Disapproved 11-9-18
 Vice President for Academic Affairs (Sign and Print) Date

COVER SHEET

This sheet (including the Checklist) MUST accompany the paper hard copy of the proposal that is routed through the signature process.

Program: (as listed in current catalog)	Biomedical Sciences Area Bachelor of Science
Department: (as listed in current catalog)	Biology and Chemistry
College: (as listed in current catalog)	Science

Helpful Information:

1. Important Definitions Used in the Curriculum Process

- Area = a program of study comprised of at least 48 hours
- Major = a program of study comprised of at least 30 hours, accompanied by a minor
- Minor = a set of discipline-specific courses of at least 21 hours
- Certificate = a series of courses related to a specific topic or skill with a prescribed number of hours. For additional information contact the Office of Academic Programs at 783-2003 or email undergraduate@moreheadstate.edu.
- Core = a set of required courses taken by all students in a specific Area or Major
- Track = a subset of courses within an area or major designed to develop expertise in a particular topic at the undergraduate level
- Equated courses vs. cross-listed courses = equated courses are courses of identical content that have different prefixes (and are approved through the undergraduate curriculum process), whereas cross-listed courses have the same instructor and are offered at the same time/location.
- Pre-requisite = course(s) that a student must successfully complete prior to registering for a more advanced course.
- Co-requisite = course(s) that a student must take concurrently with another course.

2. An Associate's Degree normally requires at least 60 semester hours including 15 hours of prescribed general education credit.

3. A baccalaureate degree program at the undergraduate level is either an Area or a Major.

4. A program's total credit hours include program core (i.e., courses taken by all students in the program), program supplemental courses (other required hours), and program specific electives. No general education courses or free elective courses count toward total program hours.

5. Curriculum should be designed so that the program's total credit hours plus general education hours and free electives add up to 120 total hours, with 42 of the hours in upper division (i.e., 300- to 400-level) courses.

6. To ensure that students enrolled in a program have common experiences, fifty percent (50%) of a program's total credit hours must be made up of core courses.

Examples:

- a. If an Area is designed with 48 hours, then 24 or more of those hours must be in core courses. The rest of the program hours can be other program requirements that vary from student to student.
- b. If a Major is designed with 30 hours, then 15 or more of those hours must be in core courses. The remainder of the major hours can be other program supplemental courses and program specific electives that vary from student to student. The minor is not considered in calculations for this 50% rule.
- c. If a Major has 30 hours and includes tracks, the core must contain at least the same number (or

higher) of hours as the track. For example, a Major could have 15 hours in core, 9 hours in the track, and 6 hours as program electives.

7. Any proposal with a secondary education component must be routed through the Teacher Education Council.
8. Edits to the proposal may be requested at any level of review. Such edits should be made by the originator of the proposal. The originator also may be asked to address questions (in writing or in person) at any level of review.

CHECKLIST

The initiator will review the final document and complete the checkboxes on the left side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the Department Curriculum Committee Chair for their review.

The Department Curriculum Committee Chair will review the document and complete the checkboxes on the right side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the next level.

Initiator	Department Curriculum Committee Chair
<input checked="" type="checkbox"/> The curriculum proposal form has not been altered (formatting, font, etc.).	<input checked="" type="checkbox"/>
<input type="checkbox"/> If an Information Technology signature is required, it has been obtained.	<input type="checkbox"/>
<input type="checkbox"/> If a Teacher Education Council signature is required, the next approval level will be notified so that it can be obtained.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Grammar, spelling, punctuation, sentence structure, etc. is accurate.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The title, department, and college names correspond to the current catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The impacted departments, programs, the individuals notified, and the method of notification are listed.	<input checked="" type="checkbox"/>
Impact is defined as any program or department that requires the course, offers the course as an elective, offers a similar course, has an equated course, has the course listed as a co-requisite or pre-requisite, shares staff and/or resources.	
<input checked="" type="checkbox"/> Responses are complete and applicable for each question.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Each course pre-fix, number, and title is consistent with the current undergraduate catalog (or with revisions made in supporting curriculum proposals).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Each course has been reviewed for pre-requisites, co-requisites or testing requirements. There are no hidden pre-requisites, co-requisites, or testing requirements.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The program core contains at least 50% of the total program hours (not including general education and free elective hours)	<input type="checkbox"/>
<input type="checkbox"/> The program core does not contain courses that should be listed in other sections of the proposal (i.e. Other Program Required Hours, Program Electives, etc.).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The program has an adequate number of area/major hours (minimum of 48 for area and minimum 30 for major).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The program has at least 42 upper division hours.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> If the program is a major, hours are designated for an accompanying minor.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> If the program has tracks, the total track hours do not exceed the total core hours.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The program has a maximum of 120 hours. If not, sufficient rationale is included in the proposal.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The curriculum maps each start on a separate page.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The curriculum map contains the official name of the program and track (if applicable).	<input checked="" type="checkbox"/>

PROGRAM

Major Revision of Existing Program

The outline below is to be used for program revisions. Each revised or new course included in this program requires a separate "New Course or Major Revision to Existing Course" proposal. *Note: an amended curriculum map must be attached to each "Major Revision of Existing Program" proposal.*

I. EXISTING PROGRAM REVISION
<p>State the current title of the Program (as listed in the current catalog).</p> <p>Biomedical Sciences Area Bachelor of Science</p>
<p>List the degree (e.g. Bachelor of Science) and major or area (e.g. Math Major, Biology Area); as listed in the current catalog. Include tracks if applicable (e.g. Bachelor of Arts, Philosophy Major, Religious Studies Track).</p> <p>Biomedical Sciences Area Bachelor of Science Biomedical Track, Biomedical Sciences Area Bachelor of Science 4+1 Track</p>
<p>State the proposed revised title of the Program (if applicable)</p> <p>N/A</p>
<p>If the degree (e.g. Bachelor of Science) and/or major or area (e.g. Math Major, Biology Area) names are changing, please list them below. Include tracks if applicable.</p> <p>N/A</p>
<p>CIP Code - <i>Contact your department chair to verify the correct CIP Code information.</i></p> <p>26.0101 Biology/Biological Sciences, General</p>
II. NEED AND JUSTIFICATION
<p>A. Describe the changes and justify what this proposal is requesting; what are you doing and why are you doing it?</p> <p>There was miscommunication with the contents of the previous proposal regarding the specific general education courses. This has caused confusion about the program requirements and has resulted in a negative impact on students. We are revising the specific general education MATH courses by reverting to the content that was in the catalog prior to the previous curriculum proposal; which was actually our intent for the last proposal.</p>
<p>B. Have the admission requirements changed? If so, how?</p> <p>No</p>
<p>C. If a similar program exists at MSU or in Kentucky, identify that program and provide justification for the duplication.</p> <p>There are no other similar programs at MSU. Western Kentucky University has similar program (JUMP) for biology majors. Offering the program at Morehead State will provide opportunities for highly motivated students to earn two degrees (B.S. Biomedical Sciences and M.S. Biology).</p>
III. PURPOSE, GOALS, AND OBJECTIVES
<p>A. What are the goals and objectives of this proposal?</p> <p>This program proposal is exclusively to revise the required general education courses in MATH. There is no change to the other curriculum.</p>
<p>B. State the revised program outcomes or competencies to be achieved by students.</p> <p>There is no revision to the program outcomes or competencies to be achieved by students.</p>
<p>C. How do the specific goals and objectives relate to the mission statement of the University?</p> <p>The Biomedical Sciences program is designed to provide strong foundations for the development of professionals in the biological disciplines. As a community of learners committed to individual achievement, our mission is to educate students for success in a global environment. The Biomedical Sciences program supports this success by establishing and maintaining high standards for all students enrolled in the program. Specifically, students will (1) develop a fundamental knowledge base in the diverse disciplines of biology (Biological Knowledge); and (2) develop skills in laboratory settings in the appropriate application of the Scientific method.</p> <p>Biological Knowledge – a comprehensive exam is administered to students during the capstone course to assess student knowledge in the following subject areas: Genetics, Microbiology, Biochemistry, Cell Biology, and Anatomy and Physiology.</p> <p>Scientific Method – the following course-embedded assessment activities are utilized to assess student</p>

understanding of the scientific method and performance of laboratory skills: Micropipetting, Graphing, Gram staining and Microscopy, and DNA Sequence Analysis.

D. List the methods of program assessment to be used, other than course grades, to ensure that the desired outcomes or competencies are attained by students. Indicate the frequency of assessment and how results will be made available to program faculty.

For Biomedical Sciences, the following will be used to evaluate competency:

1. Departmental Exit Examination scores. This is a multiple choice exam offered once during the capstone course.
2. Laboratory skills performance assessments administered in selected Program core biology courses. These assessments occur twice in BIOL 317, and once each in BIOL 301 and BIOL 304. All performance assessments are scored against developed rubrics.

For 1 and 2, results are compiled into an annual WEAVE report that will be distributed to the BIOC faculty.

3. Performance of graduates on entrance examinations to post-baccalaureate programs (GRE, MCAT, PCAT, DAT).
4. Employer feedback.
5. Graduate feedback.

E. List discipline-specific standards for accreditation in addition to Southern Association of Colleges and Schools (SACS) accreditation standards. If applicable, attach a current statement of requirements.

N/A

IV. IMPACT

A. How will the program changes affect transfer students?

Transfer students should not be affected as most community colleges and universities offer programs of study in biology. We are in the process of developing a degree pathway as a part of the Kentucky Council of Post Secondary Education's KnowHow2Transfer initiative to make transferring to Morehead State University a smoother transition.

B. List all departments and programs that could be impacted by this proposal. For example, any department or program that:

- a. offers required courses for this program
- b. offers elective courses for this program
- c. offers similar courses in their program
- d. has an equated course
- e. has courses in this proposal listed as a co-requisite or pre-requisite
- f. shares staff and/or resources

C. Explain the potential impact on the other departments and programs.

No other programs or departments will be impacted.

D. List each of the individuals in the other departments and programs notified by the proposing department chair and define the method of contact (e-mail, phone conversation, etc.)

N/A

E. Does this program revision require new technology? Please note that Information Technology (GH 110) should be notified when the program proposal is being developed. Early notification will allow IT an opportunity to provide quality information that can be included in the proposal request form.

Yes No (If yes, a representative from Information Technology must sign the signature sheet.)

If yes, please list:

1. the software to be used and its estimated cost. If there is intent to utilize the software in a lab, include the estimated cost of the server based license for the software. (IT does not install individual packages in labs, only server based versions).
2. the type of hardware to be utilized.

V. PERSONNEL

A. List name(s), qualifications including highest earned degree, and academic rank(s) of departmental faculty who will teach courses in this program.

Dr. Darrin DeMoss, Ph.D., Professor
 Dr. David Eisenhour, Ph.D., Professor
 Dr. Mike Fultz, Ph.D., Professor
 Dr. Geoff Gearner, Ph.D., Professor
 Dr. Kurt Gibbs, Ph.D., Associate Professor
 Dr. Janelle Hare, Ph.D., Professor
 Dr. Charles Lydeard, Ph.D., Professor
 Ms. Malinda McMurry, M.S., Instructor
 Dr. Melissa Mefford, Ph.D., Assistant Professor
 Dr. Sean O'Keefe, Ph.D., Associate Professor
 Dr. David Peyton, Ph.D., Professor
 Dr. Brian Reeder, Ph.D., Professor
 Dr. Allen Risk, Ph.D., Professor
 Dr. David Smith, Ph.D., Associate Professor
 Dr. Craig Tuerk, Ph.D., Professor

B. Identify external or adjunct faculty, if appropriate.

N/A

C. List any additional support personnel (clerical, laboratory assistants, and technicians) needed for implementation.

N/A

D. List additional faculty including academic rank and qualifications, who must be employed during the next four years if this is implemented.

N/A

VI. ADDITIONAL INFORMATION

A. Identify the enrollment and number of graduates from this program for the past four years

You should adjust the years to include 2016-2017 and 2017-2018

Previous Four Years	Enrollment	Graduation
2017-2018	346	58
2016-2017	342	60
2015-2016	366	49
2014-2015	326	40

Enrollment in the Master of Science Biology degree program by academic year

Previous Four Years	Enrollment	Graduation
2017-2018	7	3
2016-2017	11	2
2015-2016	8	4
2014-2015	9	4

B. List anticipated enrollment and number of graduates from this program for the next four years.

The enrollment and graduate projections are for both traditional M.S. Biology and Biomedical 4+1 students. The numbers in parenthesis indicate just the Biomedical 4+1 projection.

Remove 2017-2018 add 2021-2022

Next four years	Enrollment	Graduation
2018-2019	370	50
2019-2020	370	55
2020-2021	375	60
2021-2022	375	60

Master of Science Biology degree program

Next Four Years	Enrollment	Graduation
2018-2019	16 (3)	6 (2)
2019-2020	18 (4)	7 (3)
2020-2021	18 (4)	8 (4)
2021-2022	18 (4)	8 (4)

C. Explain any additional or remodeled facilities that will be required.

N/A

D. List any additional equipment required.

N/A

E. Provide the estimated additional cost required to support this program for the next four years. Identify source of new funds (special legislative request, system reallocation, etc.).

N/A

VII. PROPOSED PROGRAM REQUIREMENTS

Please use the template below to list all Program courses. To create additional lines, tab while cursor is in the last "Course Hours" field.

Example of different types of entries. Not all programs, minors or certificates will have each type of entry.

Course Prefix (Example: ENG)	Number (Example: 100)	Course Name	Course Hours
MSU	300	Name of course	3
MSU	400	Name of variable hour course	1-3
Variable		Free Electives	9

General Education

If the Program requires specific general education courses, list them here. These courses should NOT have hours listed again in the Program requirements (e.g. exchange courses, capstone, etc.)

Remaining hours should be listed with "variable" as course prefix and "General Education" as course name with the total remaining General Education hours in course hours.

Course Prefix (Example: ENG)	Number (Example: 100)	Course Name	Course Hours
MATH	152	College Algebra (students who choose this option must also complete MATH 141) OR	3
MATH	174	Pre-Calculus OR	4
MATH	175	Calculus	4
BIOL	171	Principles of Biology I w/lab (NSC I Exchange)	4
CHEM	111	Principles of Chemistry I w/lab (NSC II Exchange)	4
BIOL	499E	Current Issues in Biomedical Sciences (Capstone)	3
Variable		General Education	24

Total General Education Hours	38-39
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Program Core Hours

Program Core courses must be taken by all students in the program. This section cannot contain options such as "MSU 111 or MSU 112" or "choose 3 hours from the following list". Any core Track hours should be listed in the Track section.

Course Prefix (Example: ENG)	Number (Example: 100)	Course Name	Course Hours
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ENG)			
BIOL	301	Biochemistry w/Lab	4
BIOL	304	Genetics w/Lab	3
BIOL	317	Principles of Microbiology w/ Lab	4
BIOL	380	Cell Biology w/ Lab	3
CHEM	112	Principles of Chemistry II w/ Lab	4
CHEM	326	Organic Chemistry I w/ Lab	4
PHYS	201/201A	Elementary Physics I w/ Lab	4
PHYS	202/202A	Elementary Physics II w/ Lab	4
MATH	353	Statistics	3

Total Program Core Hours (This total should be at least 50% or more of the Total Program Hours; not including General Education hours and free elective hours).	33
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<i>Other Program Required Hours</i>			
Other Program Required Hours are required program courses with the option of choosing between two specific courses (i.e. "MSU 111 or MSU 112"). Track hours should be listed in the Track section.			
Course Prefix (Example: ENG)	Number (Example: 100)	Course Name	Course Hours
		Students who elect to take MATH 152 as the general education MATH must also take MATH 141 – not required for students who take MATH 174 or MATH 175 as the general education course.	
MATH	141	Trigonometry	0-3

Total Other Program Required Hours	0-3
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<i>Program Electives</i>			
Program Electives are a list of required program-related courses from which a student chooses a specific number of hours. (e.g. "choose 3 hours from the following list"). Track electives should be listed in the Track section.			
Course Prefix (Example: ENG)	Number (Example: 100)	Course Name	Course Hours

Total Program Elective Hours	0
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IF YOUR PROGRAM DOES NOT HAVE TRACKS, PLEASE PROCEED TO THE FREE ELECTIVE SECTION BELOW.

*Please note: If you need more than three tracks, please contact undergraduate@moreheadstate.edu so that the forms can be revised to fit your needs.

<i>Program Track Name:</i> Biomedical Track
--

Please list all Track Requirements			
Course Prefix (Example: ENG)	Number (Example: 100)	Course Name	Course Hours
		Choose 26 hours from the following	
BIOL	199	Selected Workshop Topics	1-4
BIOL	244	Human Anatomy and Physiology I	3
BIOL	244A	Human Anatomy and Physiology I Lab	1
BIOL	245	Human Anatomy and Physiology II	3
BIOL	245A	Human Anatomy and Physiology II Lab	1
BIOL	336	Pathophysiology	4
BIOL	337	Comparative Anatomy	3
BIOL	338	Developmental Biology	4
BIOL	385	Neurobiology	3
BIOL	399	Selected Workshop Topics	1-4
BIOL	424	Immunology	3
BIOL	425	Animal Physiology	3
BIOL	427	Pathogenic Microbiology	3
BIOL	428	Virology	3
BIOL	429	Histology	3
BIOL	443	General Parasitology	3
BIOL	444	Clinical Laboratory Procedures	3
BIOL	446	Biotechnology	3
BIOL	447	Organ Systems Physiology	4
BIOL	451	Advanced Cell Biology	3
BIOL	473	Medical-Veterinary Entomology	4
BIOL	476	Special Problems	1-6
BIOL	490	Biochemistry	4
BIOL	493	Laboratory Techniques in Biochemistry	2
BIOL	499D	Principles of Evolution	3
CHEM	327	Organic Chemistry II	4

Total Track Hours	26
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<i>Program Track Name: 4 + 1 Track</i>			
Please list all Track Requirements			
Course Prefix (Example: ENG)	Number (Example: 100)	Course Name	Course Hours
		Choose 26 Hours from the following approved electives, including three 600-level graduate courses	

BIOL	199	Selected Workshop Topics	1-4
BIOL	244	Human Anatomy I	3
BIOL	244A	Human Anatomy I Lab	1
BIOL	245	Human Anatomy II	3
BIOL	345A <i>245A</i>	Human Anatomy II Lab	1
BIOL	336	Pathophysiology	4
BIOL	337	Comparative Anatomy	3
BIOL	338	Developmental Biology	4
BIOL	385	Neurobiology	3
BIOL	399	Selected Workshop Topics	1-4
BIOL	425	Animal Physiology	3
BIOL	444	Clinical Laboratory Procedures	3
BIOL	476	Special Problems	1-6
BIOL	493	Laboratory Techniques in Biochemistry	2
BIOL	499D	Principles of Evolution	3
CHEM	327	Organic Chemistry II	4
BIOL	424	Immunology OR	3
BIOL	624	Immunology	3
BIOL	427	Pathogenic Microbiology OR	3
BIOL	627	Pathogenic Microbiology	3
BIOL	428	Virology OR	3
BIOL	628	Virology	3
BIOL	429	Histology OR	3
BIOL	629	Histology	3
BIOL	443	General Parasitology OR	3
BIOL	643	General Parasitology	3
BIOL	446	Biotechnology OR	3
BIOL	646	Biotechnology	3
BIOL	447	Organ Systems Physiology OR	4
BIOL	647	Organ Systems Physiology	4
BIOL	451	Advanced Cell Biology OR	3
BIOL	651	Advanced Cell Biology	3
BIOL	473	Medical-Veterinary Entomology OR	4
BIOL	673	Medical-Veterinary Entomology	4
BIOL	490	Biochemistry OR	4
BIOL	690	Biochemistry	4
		Biology courses taken for undergraduate credit may not also be taken for Biology Graduate credit.	

Total Track Hours	26
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Program Track Name:

Please list all Track Requirements

Course Prefix (Example: ENG)	Number (Example: 100)	Course Name	Course Hours

Total Track Hours	
--------------------------	--

Free Electives:

Free Electives are any course hours still necessary to meet the 120-hour degree requirement after all program requirements are met.

Course Prefix (Example: ENG)	Number (Example: 100)	Course Name	Course Hours
Variable	Variable	Free Electives	19-23

Total Free Elective Hours	19-23
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TOTAL DEGREE HOURS

(Total degree hours should equal 120 or contain a rationale as to why it cannot).

120

Rationale as to why program exceeds 120 hours (if applicable):

If there is a change to the current catalog language for program competencies, admission criteria, standardized testing requirements, etc., please list the NEW catalog language below. Do not list the old catalog language. Do not list the program courses again.

Curriculum Map – (Biomedical Sciences Bachelor of Science, Biomedical Track)

NOTE: If you are required to complete any developmental courses, you may not be able to complete the degree in four years. This curriculum map assumes that you have not transferred in any previously completed college level courses.

All students must have 36 hours of general education courses that include:

FYS – First Year Seminar	ENG 100 – Core Writing I
COMS 108 – Fund. Of Speech Communication	ENG 200 – Core Writing II
MATH 131, 135, 152, 174 or 175 - CORE Math	Capstone

One 3-credit hour course from each of the following categories

HUM I	SBS I	NSC I
HUM II	SBS II	NSC II

The approved course list may be accessed through the current MSU Undergraduate Catalog.

FIRST YEAR COURSE SCHEDULE								
✓	Fall Semester	Code	Credits	✓	Spring Semester	Code	Credits	
	FYS 101	G	3		Biomedical Sciences Elective (recommend BIOL 244 + 244A)	P E	4	
	ENG 100	G	3		MATH 141 or General Elective	PR or E	3	
	MATH 152 (must also take MATH 141) OR MATH 174, OR MATH 175	GPR	3-4		CHEM 111	GPR	4	
	BIOL 171	GPR	3		CHEM 111 Lab	GPR	0	
	BIOL 171L	GPR	1		COMS 108	G	3	
	HUM I – Humanities	G	3					
			Total Credit Hours				Total Credit Hours	14

SECOND YEAR COURSE SCHEDULE								
✓	Fall Semester	Code	Credits	✓	Spring Semester	Code	Credits	
	Biomedical Sciences Elective (recommend BIOL 245 + 245A)	PE	4		BIOL 301	PRU	4	
	CHEM 112	PR	4		BIOL 301L	PRU	0	
	CHEM 112L	PR	0		BIOL 317	PRU	4	
	ENG 200	G	3		BIOL 317L	PRU	0	
	SBS I Social Behavioral Science	G	3		SBS II Social/Behavioral Science	G	3	
	BIOL 304	PRU	3		HUM II Humanities	G	3	
	BIOL 304L	PRU	0					
			Total Credit Hours				Total Credit Hours	14

THIRD YEAR COURSE SCHEDULE								
✓	Fall Semester	Code	Credits	✓	Spring Semester	Code	Credits	
	BIOL 380	PRU	3		Biomedical Sciences Elective	PEU	3-4	
	BIOL 380L	PRU	0		Biomedical Sciences Elective	PEU	3-4	
	CHEM 326	PRU	4		MATH 353	PRU	3	
	CHEM 326L	PUR	0		PHYS 202	PR	3	
	PHYS 201	PR	3		PHYS 202A	PR	1	
	PHYS 201A	PR	1					
	General Elective	E	3					
			Total Credit Hours				Total Credit Hours	13-15

FOURTH YEAR COURSE SCHEDULE								
✓	Fall Semester	Code	Credits	✓	Spring Semester	Code	Credits	
	Biomedical Science Elective	PEU	3-4		BIOL 499E	GPRU	3	
	Biomedical Sciences Elective	PEGr	3-4		Biomedical Sciences Elective	PEGr	3-4	
	General Elective	E	3		Biomedical Sciences Elective	PEGr	3-4	
	General Elective	E	3		General Elective	E	3	
					General Elective	EU	3	
			Total Credit Hours				Total Credit Hours	15-17

(E) Elective,
(P) Pre-requisite

(G) General Education Course
(R) Required Course

(S) Supplemental
(U) Upper Division Course 300-400 level (you must have 42 hours)

(Gr) Graduate Course

Curriculum Map – (Biomedical Sciences Bachelor of Science, 4 + 1 Track)

NOTE: If you are required to complete any developmental courses, you may not be able to complete the degree in four years. This curriculum map assumes that you have not transferred in any previously completed college level courses.

All students must have 36 hours of general education courses that include:

- | | |
|--|---------------------------|
| FYS – First Year Seminar | ENG 100 – Core Writing I |
| COMS 108 – Fund. Of Speech Communication | ENG 200 – Core Writing II |
| MATH 131, 135, 152, 174 or 175 - CORE Math | Capstone |

One 3-credit hour course from each of the following categories

- | | | |
|--------|--------|--------|
| HUM I | SBS I | NSC I |
| HUM II | SBS II | NSC II |

The approved course list may be accessed through the current MSU Undergraduate Catalog.

FIRST YEAR COURSE SCHEDULE								
✓	Fall Semester	Code	Credits		✓	Spring Semester	Code	Credits
	FYS 101	G	3			Biomedical Sciences Elective (recommend BIOL 244 + 244A)	P E	4
	ENG 100	G	3			MATH 141 or General Elective	PR or E	3
	MATH 152 (must also take MATH 141) OR MATH 174, OR MATH 175	GPR	3-4			CHEM 111	GPR	4
	BIOL 171	GPR	3			CHEM 111 Lab	GPR	0
	BIOL 171L	GPR	1			COMS 108	G	3
	HUM I – Humanities	G	3					
Total Credit Hours			16-17		Total Credit Hours			14

SECOND YEAR COURSE SCHEDULE								
✓	Fall Semester	Code	Credits		✓	Spring Semester	Code	Credits
	Biomedical Sciences Elective (recommend BIOL 245 + 245A)	PE	4			BIOL 301	PRU	4
	CHEM 112	PR	4			BIOL 301L	PRU	0
	CHEM 112L	PR	0			BIOL 317	PRU	4
	ENG 200	G	3			BIOL 317L	PRU	0
	SBS I Social Behavioral Science	G	3			SBS II Social/Behavioral Science	G	3
	BIOL 304	PRU	3			HUM II Humanities	G	3
	BIOL 304L	PRU	0					
Total Credit Hours			17		Total Credit Hours			14

THIRD YEAR COURSE SCHEDULE								
✓	Fall Semester	Code	Credits		✓	Spring Semester	Code	Credits
	BIOL 380	PRU	3			Biomedical Sciences Elective	PEU	3-4
	BIOL 380L	PRU	0			Biomedical Sciences Elective	PEU	3-4
	CHEM 326	PRU	4			MATH 353	PRU	3
	CHEM 326L	PUR	0			PHYS 202	PR	3
	PHYS 201	PR	3			PHYS 202A	PR	1
	PHYS 201A	PR	1					
	General Elective	E	3					
Total Credit Hours			14		Total Credit Hours			13-15

FOURTH YEAR COURSE SCHEDULE								
✓	Fall Semester	Code	Credits		✓	Spring Semester	Code	Credits
	Biomedical Science Elective	PEU	3-4			BIOL 499E	GPRU	3
	Graduate Biomedical Sciences Elective	PE	3-4			Graduate Biomedical Sciences Elective	PE	3-4
	General Elective	E	3			Graduate Biomedical Sciences Elective	PE	3-4
	General Elective	E	3			General Elective	E	3
						Advanced General Elective	EU	3
Total Credit Hours			12-14		Total Credit Hours			15-17

- | | | |
|-------------------|------------------------------|--|
| (E) Elective, | (G) General Education Course | (S) Supplemental |
| (P) Pre-requisite | (R) Required Course | (U) Upper Division Course 300-400 level (you must have 42 hours) |



Department of Biology and Chemistry

103 Lappin Hall | Morehead, KY 40351

P: 606-783-2945 | F: 606-783-5002

www.moreheadstate.edu

10 October 2018

To the University Community-

Attached is a Curriculum Proposal for the B. S. Biomedical Sciences program. The proposal is a minor revision to correct a mathematics requirement issue. In the 2017-2018 and 2018-2019 Undergraduate Catalogs, the B. S. Biomedical Sciences program description indicates that students take MATH 152 to satisfy General Education and program requirements. Previous catalogs indicated that students could take MATH 152, MATH 174 or MATH 175 to satisfy General Education and program requirements. If students chose MATH 152, then they were also required to take MATH 141. When the B. S. Biomedical Sciences 4+1 program was approved in 2016, implementation of it failed to indicate that students had a choice on fulfilling the math requirement. The proposed revision corrects this.

Respectfully,

A handwritten signature in black ink, appearing to read 'Geoff Gearner', followed by a long horizontal line extending to the right.

Geoff Gearner, Ph.D.

Professor of Biology

Dept. of Biology and Chemistry



PROGRAM/MINOR/CERTIFICATE
Deletion/Reinstatement for Program or Minor or Certificate
Undergraduate Curriculum Routing Form

July 2018

Program/Minor/Certificate: (as listed in the current catalog)	Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track
Department: (as listed in the current catalog)	Biology and Chemistry
College: (as listed in the current catalog)	Science

The proposal form language and formatting cannot be altered in any way. If the form has been altered, it will be returned to the initiator for revision.

Please note: it is the initiator's responsibility to track a proposal through the approval process.

Signatures (Signatures must be handwritten; electronic signatures are not accepted.)

The Departmental Curriculum Committee Chair will review and complete the checklist on the next page to indicate their approval.

Departmental Curriculum Committee

[Signature] *CREOLE LUC ANTOINE* Approved () Disapproved *8-27-18*
 Department Chair or Associate Dean (Sign and Print) Date

[Signature] *Charles Lyderd* Approved () Disapproved *9/4/18*
 College Curriculum Committee (Sign and Print) Date

[Signature] *DINA GROPE* Approved () Disapproved *2018-Sep-07*
 Dean (Print and Sign) Date

[Signature] *[Signature]* Approved () Disapproved *9/10/2018*
 Teacher Ed. Council (if program, as a secondary education program) (Sign and Print) Date

N/A *10/3/18*
Once the proposal has been approved through the above levels, the initiator will route the FINAL paper document to Howell McDowell 204 and submit the FINAL electronic WORD document to undergraduate@moreheadstate.edu (the two documents must be exactly the same).

Laurie Couch *Laurie Couch* Approved () Disapproved *11/07/18*
 AVP UESS-CPE Academic Programs Liaison (Sign and Print) Date

Laurie Couch *Laurie Couch* Approved () Disapproved *11/07/18*
 Undergraduate Curriculum Committee (Sign and Print) Date

[Signature] *[Signature]* Approved () Disapproved *11-9-18*
 Vice President for Academic Affairs (Sign and Print) Date

<i>For Academic Programs Office Use Only</i>		
_____ Program	_____ Minor	_____ Certificate
Official Suspension Date: _____	Date CPE Notified of Suspension: _____	
<i>For CPE reporting purposes, a deleted program will be marked as suspended for a minimum of 2 years and a maximum of 5 years to allow for the teach-out plan.</i>		
Date AVP UESS notified SAC's Liaison: _____	SAC's Response Date: _____	
Date AVP UESS notified of SAC's Response: _____	SACS Response: <input type="checkbox"/> Approved <input type="checkbox"/> Denied <input type="checkbox"/> Revision Required	
Last Catalog Date: _____	Date CPE Notified of Deletion: _____	Program/Minor/Certificate Final Deletion Date: _____

COVER SHEET

This sheet (including the Checklist) MUST accompany the paper hard copy of the proposal that is routed through the signature process.

Program: (as listed in current catalog)	Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track
Department: (as listed in current catalog)	Biology and Chemistry
College: (as listed in current catalog)	Science

Helpful Information:

1. Any proposal with a secondary education component must be routed through the Teacher Education Council.
2. Edits to the proposal may be requested at any level of review. The originator of the proposal should make such edits. The originator also may be asked to address questions (in writing or in person) at any level of review.
3. Students must be admitted to the Program until the proposal has been approved.
4. The program will remain in the catalog until the fall after the proposal is approved.

CHECKLIST

The initiator will review the final document and complete the checkboxes on the left side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the Department Curriculum Committee Chair for their review.

The Department Curriculum Committee Chair will review the document and complete the checkboxes on the right side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the next level.

Initiator	Department Curriculum Committee Chair
<input checked="" type="checkbox"/> The curriculum proposal form has not been altered (formatting, font, etc.).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> If a Teacher Education Council signature is required, the next approval level will be notified so that it can be obtained.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Grammar, spelling, punctuation, sentence structure, etc. is accurate.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The title, department, and college names correspond to the current catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The impacted departments, programs, the individuals notified, and the method of notification are listed.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Responses are complete and applicable for each question.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Students have ample time to finish all the required and elective courses in the teach-out plan.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The teach-out plan is inserted into the proposal.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Student impact numbers are official data obtained through Institutional Effectiveness.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The sample student notification letter is inserted into the proposal.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> If this is a collaborative or joint program with another institution, the signed teach-out agreements with the other institution(s) are attached.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The entire proposal is saved as one Word document.	<input checked="" type="checkbox"/>

My signature verifies that I have reviewed the proposal and it is ready to go to the next level.

 Brandon VanNess
Originator (Sign and Print)

8/27/2018
Approval Date

 Geoff Grew
Department Curriculum Committee Chair (Sign and Print)

8-27-18
Approval Date

PROGRAM/MINOR/CERTIFICATE

Deletion/Reinstatement for Program or Minor or Certificate

This outline is to be followed for program/minor/certificate deletion or reinstatement.

<input checked="" type="checkbox"/>	Program	Title:	Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track
<input type="checkbox"/>	Minor	(as listed in the current catalog)	
<input type="checkbox"/>	Certificate		
<input checked="" type="checkbox"/>	Deletion – Program/Minor/Certificate will be removed and cannot be reinstated.		
<input type="checkbox"/>	Reinstatement - brings back from suspension. Cannot be used if Program/Minor/Certificate has been permanently deleted.		
CIP Code <i>Contact your department chair or associate dean to verify the correct CIP code information.</i>			
40-0501			

TYPE OF ACTION

I. PROGRAM/MINOR/CERTIFICATE DELETION

*For CPE reporting purposes, a deleted program will be marked as suspended for a minimum of 2 years and a maximum of 5 years to allow for the teach-out plan.

a. Proposed date students are no longer allowed to enroll (students must be allowed to enter the program until after the official closure date):	July 2019
b. Date all students must have completed the teach-out plan:	August 2023
c. Proposed final program/minor/certificate deletion date (Program closures and teach-out plans require approval by SACSCOC. The SACSOC approval date will determine the official date of closure):	August 2023

II. PROGRAM/MINOR/CERTIFICATE REINSTATEMENT

*Program reinstatement must occur within the suspension period. Prior to submission, you must contact Undergraduate Education and Student Success to determine if reinstatement timelines can be met. All reinstatements must be approved at multiple levels, including SACSCOC. The change will be in effect the catalog year following the SACSCOC approval date.

a. Official suspension date for the program:	
b. Proposed date for reinstatement	

JUSTIFICATION

A. Why is the Program, Minor, or Certificate being deleted or reinstated?

The Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track is to be deleted because it is a duplicate program. In May 2017, the Chemistry Area (MSU Teach Track) Bachelor of Science was created as a replacement to the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track. The Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track requires 132 credit hours of coursework necessary to complete the degree, while the Chemistry Area (MSU Teach Track) Bachelor of Science is streamlined to 120 credit hours to maximize the cost effectiveness for the students.

All currently enrolled students in the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track have already transferred to the Chemistry Area (MSU Teach Track) Bachelor of Science program. Additionally, upon the creation of the MSU Teach course curriculum, teaching of the SCI 402 and SCI 403 courses was suspended and these two courses, SCI 402 and SCI 403, will no longer be taught at this institution. Any student that would purposefully enroll in the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track before July 2019 would be required to take the UTCH 300 and UTCH 350 courses and substitute these two courses for the SCI 402 and SCI 403 courses in order to complete the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track. All other required courses, with the exception of SCI 402 and SCI 403, for the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track are still taught at Morehead State University.

B. List all departments and programs that could be impacted by this proposal. For example, any department or program that:

- a. offers required courses for this program, minor, or certificate
- b. offers elective courses for this program

- c. offers similar courses in their program
- d. has an equated course
- e. has courses in this proposal listed as co-requisite or pre-requisite
- f. shares staff and/or resources.
 - a. Chemistry, Biology, Mathematics, Physics, Middle Grades and Secondary Education
 - b. Chemistry
 - c. None
 - d. None
 - e. None, no courses are being deleted.
 - f. Biology, Chemistry, Middle Grades and Secondary Education

C. Explain the potential impact on the other departments and programs.
 There is no potential impact on the other departments and programs because the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track is a duplicate program that currently has zero students enrolled.

D. List the individuals in the other departments and programs notified by the proposing department and define the method of contact (e-mail, phone conversation, etc.)
 Dr. Wayne Willis, Chair, Middle Grades and Secondary Education, email.
 Dr. April Miller, Chair, Middle Grades and Secondary Education, email.
 Dr. Edna Schack, Co-Director, MSUTeach program, email.

Your information in the sections E, F, and G below should include all students who have enrolled in the program in the last 5 years (even if they are not a current student). Please contact Institutional Effectiveness for official data.

E. How many students could be impacted?
 Zero!

F. What is the impact on students?
 There is no direct impact on students. Currently, there are no students enrolled in the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track. All previously enrolled students were transferred to the Chemistry Area (MSUTeach Track) Bachelor of Science program starting in Fall 2017.

Any student that would chose to enroll in the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track prior to July 2019 would be committing themselves to 132 credit hours of coursework in order to meet the requirements of the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track. Such a decision to enroll in the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track is counterintuitive and counterproductive when the ability to join the streamlined 120 credit hour Chemistry Area (MSUTeach Track) Bachelor of Science program exists.

Any student that would chose to enroll in the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track will not be able to take SCI 402 (3 credit hours) and SCI 403 (3 credit hours) due to the suspension of teaching these two courses following the introduction of the MSUTeach curriculum. Students enrolled in the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track will need to take UTCH 300 (3 credit hours) and UTCH 350 (3 credit hours) and petition to use these two courses as course substitutions for the SCI 402 (3 credit hours) and SCI 403 (3 credit hours) courses in order to complete the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track program. All other required courses, with the exception of SCI 402 and SCI 403, for the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track are still being taught at this institution.

G. What is the impact on enrollment?

- a. University
- b. Department
- c. Program

a. There is zero impact on the enrollment at the University from the deletion of the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track since it is a duplicate program.
 b. There is zero impact on the enrollment in the Biology and Chemistry Department from the deletion of the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track.
 c. There are currently no students enrolled in the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track, so there is no impact on enrollment from deleting the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track.

H. What is the impact on staffing:
 There is no impact on staffing.

I. How will affected faculty and staff be informed of the impending reinstatement/closure?
 Email

TEACH OUT PLAN – (Program closures and teach-out plans require approval by SACSCOC.)**A. Will the teach-out plan require students to incur additional expense?** Yes No

If yes, please describe the additional expense, list how much additional expense, and identify how the students will be notified of the additional expense.

A. Please insert the teach-out plan.

There are no students currently enrolled in the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track.

Any student that purposefully registers in the 132 credit hour Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track before July 2019 must substitute UTCH 300 and UTCH 350 for SCI 402 and SCI 403 in order to complete the requirements of the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track. This is due to the suspension of teaching of the SCI 402 and SCI 403 courses at this institution. Any student that purposefully enrolls in the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track program prior to July 2019 that has not taken SCI 402 and SCI 403 prior to the suspension of teaching of those two specific courses will need to take UTCH 300 and UTCH 350 and petition to use these two courses as course substitutes for the SCI 402 and SCI 403 courses. Since SCI 402 and SCI 403 are both three credit hours and UTCH 300 and UTCH 350 are also three credit hours, there is no additional expense for this substitution. All other courses in the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track remain unchanged and will be taught at this institution.

First Semester Courses (must be completed by end of Fall 2019):

FYS 101: First Year Seminar

ENG 100: Writing I

CHEM 111 Principles of Chemistry & CHEM 111L: Principles of Chemistry Laboratory (NSC 2 exchange)

Two General Education Electives, preferably a HUM 1 and SBS 1

Second Semester Courses: (must be completed by end of Spring 2020):

CHEM 112: Principles of Chemistry II & CHEM 112L: Principles of Chemistry II Lab

COMS 108: Fundamentals of Speech Communication

MATH 175: Calculus I

One General Education Elective, preferably SBS 2

One general elective or a course for the declared Minor

Third Semester Courses: (must be completed by end of Fall 2020):

CHEM 326: Organic Chemistry I and CHEM 326L: Organic Chemistry I Laboratory

BIOL 171 Principles of Biology & BIOL 171L Principles of Biology Laboratory (NSC 1 exchange)

EDF 207: Foundations of Education

ENG 200: Writing II

One general elective or a course for the declared Minor

Fourth Semester Courses: (must be completed by end of Spring 2021)

CHEM 360: Analytical Chemistry and CHEM 360L: Analytical Chemistry Laboratory

PHYS 201: Elementary Physics I

PHYS 201A: Elementary Physics I Laboratory

EDF 211: Human Growth and Development

A CHEM Elective (any CHEM course that is 302 or higher and approved by chemistry advisor)

One General Education elective (preferably HUM 2)

Students must apply to the Teacher Education Program (TEP) by end of Spring 2021 to continue take EDF 311 in Fall 2021.

Requirements for application to the TEP are maintained by the College of Education and must be met in order to be admitted into the TEP.

Fifth Semester Courses: (must be completed by end of Fall 2021)

CHEM 351: Bioinorganic Chemistry

EDF 311: Learning Theories, Assessment, and Diversity (must have been admitted into TEP to take this course)

PHYS 202: Elementary Physics II

PHYS 202A: Elementary Physics II Lab

Two general elective or two courses for the declared Minor

Six Semester Courses:(must be completed by end of Spring 2022)
EDSE 312: Educational Methods and Technology (must have applied to TEP to take this course)
EDSP 230: Education of Exceptional Children
CHEM Elective: (any CHEM course that is 302 or higher and approved by chemistry advisor)
One general elective or one course for the declared Minor
CHEM 499C: Chemistry Senior Project I

Seventh Semester Courses: (must be completed by end of Fall 2022)
CHEM 499D: Chemistry Senior Project II
CHEM 441: Physical Chemistry
EDSE 483: Classroom Organization and Management for Secondary Teachers
UTCH 300: Classroom Interactions (is a suitable replacement for SCI 402: Integrated Biology, Mathematics and Physical Science Teaching Methods)
UTCH 350: Project-Based Instruction (is a suitable replacement for SCI 403: Integrated Biology, Mathematics and Science Field Experiences in Teaching)

Eighth Semester Courses (must be completed by end of Spring 2023)
EDSE 416: Clinical Practice (must have meet all requirements set forth by the College of Education to take this course).

A student must pass the PRAXIS I exam requirements set forth by the College of Education before the end of the Fall 2022 semester in order to be eligible to complete EDSE 416, their student teaching course, in the Spring 2023 semester. Students wishing to receive their teaching certification must also pass the PRAXIS II chemistry content exam with a score of 160 or better before the end of the Spring 2023 semester in order to be eligible to receive their teaching certification at the end of Spring 2023.

Any student that purposefully enrolls in the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track prior to July 2019 that has not completed any of the Teacher Education Requirements (EDF 207, EDF 211, EDF 311, EDSE 312, ESE 416, EDSE 483, EDSP 230) and EDUC 476 is strongly encouraged to transfer to the Chemistry Area (MSUTeach Track) Bachelor of Science program and complete the requirements of the Chemistry Area (MSUTeach Track) Bachelor of Science program (UTCH 100, UTCH 150, UTCH 200, UTCH 250, UTCH 300, UTCH 315, UTCH 350, UTCH 400, and UTCH 450).

B. You must notify all impacted students by U.S. Mail. Please insert a sample of the student notification letter.

Dear Student:

In April 2017, the Chemistry Area (MSUTeach Track) Bachelor of Science program was approved by the Morehead State University's University Curriculum Committee as a new teacher education program for the secondary chemistry teachers at this institution, effective for the Fall 2017 course catalog. The Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track is now a duplicate program at Morehead State University due to the creation of the Chemistry Area (MSUTeach Track) Bachelor of Science program.

Please contact your advisor to determine whether the Teach-Out Plan or transferring to the Chemistry Area (MSUTeach Track) Bachelor of Science program is your best option, if you have not already done so.

Regards,

Dr. Brandon VanNess
Assistant Professor of Chemistry
Biology and Chemistry
Morehead State University

C. Is this a collaborative or joint program with another institution? Yes No
If so, please attach signed copies of the teach-out agreements with the other institution(s).



Department of Biology and Chemistry
103 Lappin Hall | Morehead, KY 40351
P: 606-783-2945 | F: 606-783-5002

www.moreheadstate.edu

7 August 2018

To the University Community,

The Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track is a duplicate, antiquated teacher preparation program for high school chemistry teachers at this institution that has zero students enrolled and has reached the end of its usefulness. Now is the time to officially delete the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track from the course catalog and place our focus on the replacement program, the Chemistry Area (MSUTeach Track) Bachelor of Science program.

In June 2016, the need to reinvigorate and modernize the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track was undertaken to improve enrollment in this science, technology, engineering, and math (STEM) teacher education program and also reduce the total number of program credit hours necessary to complete the degree from 132 to 120 credit hours.

The Chemistry Area (MSUTeach Track) Bachelor of Science program is part of the five program MSUTeach coalition that implement's the UTeach curriculum which was developed 22 years ago at the University of Texas in Austin to emphasize inquiry-based instruction, the relationship between the theory of pedagogy and the practice of teaching, the interconnections between math and science, and the diversity and history of STEM teaching methods. The MSUTeach curriculum consists of 17-20 hours in 7-8 courses, plus 12 hours of apprentice teaching, for a total of 29-32 hours.

In April 2017, the Chemistry Area (MSUTeach Track) Bachelor of Science program was officially approved by the Morehead State University's University Curriculum Committee as a new teacher education program for secondary chemistry education teachers at this institution and was listed as an official program in the fall 2017 course catalog.

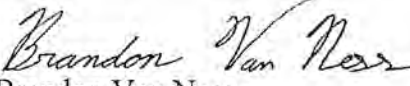
Attached is the Program/Minor/Certificate Deletion/Reinstatement for Program or Minor or Certificate proposal for the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track. The included teach-out plan incurs no additional expense upon a student since all courses, except SCI 402 and SCI 403, are still being offered at this institution. The substitution plan for SCI 402: Integrated Biology, Mathematics and Physical Science Teaching Methods (3 credit hours) is UTCH 300: Classroom Interactions (3 credit hours) and SCI 403: Integrated Biology, Mathematics and Science Field Experiences in Teaching (3 credit hours) is UTCH 350: Project-Based Instruction (3 credit hours), which is the current method of replacement for any student enrolled in a program that requires SCI 402 and SCI 403 to complete their degree.

www.moreheadstate.edu

MSU is an affirmative action, equal opportunity, educational institution.

I respectfully request that the deletion of the Chemistry Major Bachelor of Science, Chemistry with Teacher Certification (secondary) Track program be considered fully and without delay.

Respectfully,


Brandon Van Ness
Assistant Professor of Chemistry
Morehead State University



PROGRAM/MINOR/CERTIFICATE

Deletion/Reinstatement for Program or Minor or Certificate Undergraduate Curriculum Routing Form

July 2018

Program/Minor/Certificate: (as listed in the current catalog)	Literature Minor
Department: (as listed in the current catalog)	English
College: (as listed in the current catalog)	Caudill College of Arts, Humanities and Social Sciences

The proposal form language and formatting cannot be altered in any way. If the form has been altered, it will be returned to the initiator for revision.

Please note: it is the initiator's responsibility to track a proposal through the approval process.

Signatures (Signatures must be handwritten; electronic signatures are not accepted.)

The Departmental Curriculum Committee Chair will review and complete the checklist on the next page to indicate their approval.

Departmental Curriculum Committee			
Layne Neuper Department Chair or Associate Dean (Sign and Print)	<i>Layne Neuper</i>	<input checked="" type="checkbox"/> Approved () Disapproved	9/13/18 Date
College Curriculum Committee (Sign and Print)	<i>D. Wayne Dale</i>	<input checked="" type="checkbox"/> Approved () Disapproved	10/18/18 Date
Dean (Print and Sign)	<i>John Ernst</i>	<input checked="" type="checkbox"/> Approved () Disapproved	10-19-18 Date
N/A		() Approved () Disapproved	
Teacher Ed. Council (if program, is a secondary education program) (Sign and Print)			Date

Once the proposal has been approved through the above levels, the initiator will route the FINAL paper document to Howell McDowell 204 and submit the FINAL electronic WORD document to undergraduate@moreheadstate.edu (the two documents must be exactly the same).

AVP UESS-CPE Academic Programs Liaison (Sign and Print)	<i>Laurie Couch</i>	<input checked="" type="checkbox"/> Approved () Disapproved	11/07/18 Date
Undergraduate Curriculum Committee (Sign and Print)	<i>Laurie Couch</i>	<input checked="" type="checkbox"/> Approved () Disapproved	11/07/18 Date
Vice President for Academic Affairs (Sign and Print)	<i>Paul Cunniff</i>	<input checked="" type="checkbox"/> Approved () Disapproved	11-9-18 Date

For Academic Programs Office Use Only			
_____ Program	_____ Minor	_____ Certificate	
Official Suspension Date: _____	Date CPE Notified of Suspension: _____		
<i>For CPE reporting purposes, a deleted program will be marked as suspended for a minimum of 2 years and a maximum of 5 years to allow for the teach-out plan.</i>			
Date AVP UESS notified SAC's Liaison: _____	SAC's Response Date: _____		
Date AVP UESS notified of SAC's Response: _____	SACS Response: <input type="checkbox"/> Approved <input type="checkbox"/> Denied <input type="checkbox"/> Revision Required		
Last Catalog Date: _____	Date CPE Notified of Deletion: _____	Program/Minor/Certificate Final Deletion Date: _____	

COVER SHEET

This sheet (including the Checklist) MUST accompany the paper hard copy of the proposal that is routed through the signature process.

Program: (as listed in current catalog)	Literature Minor
Department: (as listed in current catalog)	English
College: (as listed in current catalog)	Caudill College of Arts, Humanities and Social Sciences

Helpful Information:

1. Any proposal with a secondary education component must be routed through the Teacher Education Council.
2. Edits to the proposal may be requested at any level of review. The originator of the proposal should make such edits. The originator also may be asked to address questions (in writing or in person) at any level of review.
3. Students must be admitted to the Program until the proposal has been approved.
4. The program will remain in the catalog until the fall after the proposal is approved.

CHECKLIST

The initiator will review the final document and complete the checkboxes on the left side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the Department Curriculum Committee Chair for their review.

The Department Curriculum Committee Chair will review the document and complete the checkboxes on the right side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the next level.

Initiator	Department Curriculum Committee Chair
<input checked="" type="checkbox"/> The curriculum proposal form has not been altered (formatting, font, etc.).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> If a Teacher Education Council signature is required, the next approval level will be notified so that it can be obtained.	<input type="checkbox"/> NA
<input checked="" type="checkbox"/> Grammar, spelling, punctuation, sentence structure, etc. is accurate.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The title, department, and college names correspond to the current catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The impacted departments, programs, the individuals notified, and the method of notification are listed.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Responses are complete and applicable for each question.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Students have ample time to finish all the required and elective courses in the teach-out plan.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The teach-out plan is inserted into the proposal.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Student impact numbers are official data obtained through Institutional Effectiveness.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The sample student notification letter is inserted into the proposal.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> If this is a collaborative or joint program with another institution, the signed teach-out agreements with the other institution(s) are attached.	<input type="checkbox"/> NA
<input checked="" type="checkbox"/> The entire proposal is saved as one Word document.	<input checked="" type="checkbox"/>

My signature verifies that I have reviewed the proposal and it is ready to go to the next level.

Robert D Royar (for Tom Williams) Robert D Royar 9/13/18
 Originator (Sign and Print) Approval Date

Robert D Royar Robert D Royar 9/13/18
 Department Curriculum Committee Chair (Sign and Print) Approval Date

PROGRAM/MINOR/CERTIFICATE
Deletion/Reinstatement for Program or Minor or Certificate

This outline is to be followed for program/minor/certificate deletion or reinstatement.

<input type="checkbox"/>	Program	Title:	
<input checked="" type="checkbox"/>	Minor	(as listed in the current catalog)	Literature Minor
<input type="checkbox"/>	Certificate		
<input checked="" type="checkbox"/>	Deletion – Program/Minor/Certificate will be removed and cannot be reinstated.		
<input type="checkbox"/>	Reinstatement - brings back from suspension. Cannot be used if Program/Minor/Certificate has been permanently deleted.		
CIP Code <i>Contact your department chair or associate dean to verify the correct CIP code information.</i>			
23.0101			

TYPE OF ACTION	
I.	PROGRAM/MINOR/CERTIFICATE DELETION *For CPE reporting purposes, a deleted program will be marked as suspended for a minimum of 2 years and a maximum of 5 years to allow for the teach-out plan.
a.	Proposed date students are no longer allowed to enroll (students must be allowed to enter the program until after the official closure date):
	08/15/2019
b.	Date all students must have completed the teach-out plan:
	01/01/2024
c.	Proposed final program/minor/certificate deletion date (Program closures and teach-out plans require approval by SACSCOC. The SACSCOC approval date will determine the official date of closure):
	01/01/2024
II.	PROGRAM/MINOR/CERTIFICATE REINSTATEMENT *Program reinstatement must occur within the suspension period. Prior to submission, you must contact Undergraduate Education and Student Success to determine if reinstatement timelines can be met. All reinstatements must be approved at multiple levels, including SACSCOC. The change will be in effect the catalog year following the SACSCOC approval date.
a.	Official suspension date for the program:
b.	Proposed date for reinstatement

JUSTIFICATION
A. Why is the Program, Minor, or Certificate being deleted or reinstated? The minor has not attracted students for a number of years. Currently no student is enrolled.
B. List all departments and programs that could be impacted by this proposal. For example, any department or program that: <ol style="list-style-type: none"> a. offers required courses for this program, minor, or certificate b. offers elective courses for this program c. offers similar courses in their program d. has an equated course e. has courses in this proposal listed as co-requisite or pre-requisite f. shares staff and/or resources. Philosophy and History each offer courses from which students must choose one course per program (6 hours total). All the courses are offered for the two departments' own majors.
C. Explain the potential impact on the other departments and programs. No impact on other programs. Courses offered in History and Philosophy are part of their major rotation.
D. List the individuals in the other departments and programs notified by the proposing department and define the method of contact (e-mail, phone conversation, etc.) Dr. Alana Scott (History) and Dr. Christina Conroy (Philosophy) coordinator their programs. They were contacted via email: Sent from r.royar@moreheadstate.edu on 16 October 2017 Alana and Christina,

I am contacting you because we have decided to delete our Literature Minor. It has had no more than one student in it for the last 6 years, and at times, none. Each of your programs has one course required for our minor. Students select the courses from two lists of required electives. Here are the two lists:

History

Select one of the following courses:

HST 260, HST 261, HST 313, HST 316, HST 317, HST 343, and HST 354

Philosophy

Select one of the following courses:

PHIL 200, PHIL 308, PHIL 313, PHIL 355, PHIL 356, PHIL 389, PHIL 410

We are required to solicit your opinion on this deletions.

Please let me know of any questions you have.

Robert

--

Dr. Robert Delius Royar PhD, Associate Professor of English
Morehead State University r.royar@moreheadstate.edu
Coordinator of Undergraduate English

Replies Received 16 October 2017

Philosophy

Hi Robert,

Thanks for letting me know. I support the decision that the English department thinks is best.

Christina

History

Robert,

Thanks for letting us know. I didn't remember having any literature students lately. Seems odd not to have more students interested, though.

ACS

Your information in the sections E, F, and G below should include all students who have enrolled in the program in the last 5 years (even if they are not a current student). Please contact Institutional Effectiveness for official data.

E. How many students could be impacted?

0

F. What is the impact on students?

None, no students are listed in the minor according to institutional effectiveness records.

G. What is the impact on enrollment?

- a. University
- b. Department
- c. Program

None for any of a, b, or c

H. What is the impact on staffing:

none

I. How will affected faculty and staff be informed of the impending reinstatement/closure?

Faculty and staff will be informed by email and in regular department/college meetings.

TEACH OUT PLAN – (Program closures and teach-out plans require approval by SACSCOC.)

A. Will the teach-out plan require students to incur additional expense? Yes No

If yes, please describe the additional expense, list how much additional expense, and identify how the students will be notified of the additional expense.

A. Please insert the teach-out plan.

According to Institutional Effectiveness, there are no students in the minor program as of fall 2018. All courses in the minor are offered in regular rotation within our department. Email from IE:

See copy of email from Matt Baldwin sent to Associate Dean Neeper (after protected section)

B. You must notify all impacted students by U.S. Mail. Please insert a sample of the student notification letter.

Dear STUDENT:

The Morehead State University Department of English has decided to delete the English Literature Minor. Our records indicate that you are currently minoring in English Literature. You will be given four years (until December 2022) to complete your degree with a minor in Literature. Our records indicate that you have yet to complete a course in the English Literature Minor. For that reason, we encourage you to meet with your minor advisor as soon as possible to determine the sequence of the required minor courses will best fit with your existing program major.

The Department of English is committed to offering programs and minors that it can maintain. Because interest in the English Literature Minor has declined precipitously over the last decade, we have determined that our assessment and recruitment efforts are better directed to our minors in Creative Writing, English, and Linguistics.

Your advisor can help you plan a course of action to ensure your successful graduation on your current timeline. Rest assured that the English courses required for the English Literature Minor will continue to be offered in the same rotation as they have been offered in the past. Should unforeseen difficulties interfere with any of the courses' continuing, your advisor can work with the Associate Dean for the School of English Communication, Media, & Languages to arrange for courses to be substituted for those which are no longer offered.

We wish you the best of luck in your future educational endeavors at Morehead State University.

C. Is this a collaborative or joint program with another institution? Yes No

If so, please attach signed copies of the teach-out agreements with the other institution(s).

From: Matthew Alan Baldwin <m.baldwin@moreheadstate.edu>
Date: September 6, 2018 at 4:39:51 PM EDT
To: Layne Neeper <l.neeper@moreheadstate.edu>
Cc: "Courtney T. Andrews" <c.andrews@moreheadstate.edu>
Subject: Active Literature Minors

Layne,

There are no active literature minors. The last person to minor in that ended it in January 2018. Let me know if you need anything else.

Matt Baldwin
Associate Director of Institutional Research and Analysis
101G Howell-McDowell Administration Building
Morehead State University
Morehead, KY 40351
606.783.9508



PROGRAM/MINOR/CERTIFICATE
Deletion/Reinstatement for Program or Minor or Certificate
Undergraduate Curriculum Routing Form

July 2018

Program/Minor/Certificate: <small>(as listed in the current catalog)</small>	ECONOMICS MINOR
Department: <small>(as listed in the current catalog)</small>	School of Business Administration
College: <small>(as listed in the current catalog)</small>	Elmer R. Smith College of Business and Technology

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Please note: it is the initiator's responsibility to track a proposal through the approval process.

Signatures (Signatures must be handwritten; electronic signatures are not accepted.)

The Departmental Curriculum Committee Chair will review and complete the checklist on the next page to indicate their approval.

Departmental Curriculum Committee

Johnathan New [Signature] Approved () Disapproved 10/5/18
 Date

Department Chair or Associate Dean (Sign and Print)

Teame Ghirmay [Signature] Approved () Disapproved 10/09/18
 Date

College Curriculum Committee (Sign and Print)

[Signature] Greg Russell Approved () Disapproved 10/10/18
 Date

Dean (Print and Sign)

N/A () Approved () Disapproved
 Date

Teacher Ed. Council (if program, is a secondary education program) (Sign and Print) _____ Date _____

Once the proposal has been approved through the above levels, the initiator will route the FINAL paper document to Howell McDowell 204 and submit the FINAL electronic WORD document to undergraduate@moreheadstate.edu (the two documents must be exactly the same).

Laurie Couch Laurie Couch Approved () Disapproved 11/07/18
 Date

AVP UESS-CPE Academic Programs Liaison (Sign and Print)

Laurie Couch Laurie Couch Approved () Disapproved 11/07/18
 Date

Undergraduate Curriculum Committee (Sign and Print)

[Signature] Approved () Disapproved 11-9-18
 Date

Vice President for Academic Affairs (Sign and Print)

For Academic Programs Office Use Only		
Official Suspension Date: _____	Date CPE Notified of Suspension: _____	_____ Program _____ Minor _____ Certificate
<i>For CPE reporting purposes, a deleted program will be marked as suspended for a minimum of 2 years and a maximum of 5 years to allow for the teach-out plan.</i>		
Date AVP UESS notified SAC's Liaison: _____	SAC's Response Date: _____	
Date AVP UESS notified of SAC's Response: _____	SACS Response: <input type="checkbox"/> Approved <input type="checkbox"/> Denied <input type="checkbox"/> Revision Required	
Last Catalog Date: _____	Date CPE Notified of Deletion: _____	Program/Minor/Certificate Final Deletion Date: _____

COVER SHEET

This sheet (including the Checklist) MUST accompany the paper hard copy of the proposal that is routed through the signature process.

Program/Minor/Certificate: <small>(as listed in the current catalog)</small>	ECONOMICS MINOR
Department: <small>(as listed in current catalog)</small>	School of Business Administration
College: <small>(as listed in current catalog)</small>	Elmer R. Smith College of Business and Technology

Helpful Information:

1. Any proposal with a secondary education component must be routed through the Teacher Education Council.
2. Edits to the proposal may be requested at any level of review. The originator of the proposal should make such edits. The originator also may be asked to address questions (in writing or in person) at any level of review.
3. Students must be admitted to the Program until the proposal has been approved.
4. The program will remain in the catalog until the fall after the proposal is approved.

CHECKLIST

The initiator will review the final document and complete the checkboxes on the left side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the Department Curriculum Committee Chair for their review.

The Department Curriculum Committee Chair will review the document and complete the checkboxes on the right side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the next level.

Initiator	Department Curriculum Committee Chair
<input checked="" type="checkbox"/> The curriculum proposal form has not been altered (formatting, font, etc.).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> If a Teacher Education Council signature is required, the next approval level will be notified so that it can be obtained.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Grammar, spelling, punctuation, sentence structure, etc. is accurate.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The title, department, and college names correspond to the current catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The impacted departments, programs, the individuals notified, and the method of notification are listed.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Responses are complete and applicable for each question.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Students have ample time to finish all the required and elective courses in the teach-out plan.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The teach-out plan is inserted into the proposal.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Student impact numbers are official data obtained through Institutional Effectiveness.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The sample student notification letter is inserted into the proposal.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> If this is a collaborative or joint program with another institution, the signed teach-out agreements with the other institution(s) are attached.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The entire proposal is saved as one Word document.	<input checked="" type="checkbox"/>

My signature verifies that I have reviewed the proposal and it is ready to go to the next level.

<u>Jonathan Nelson</u>	<u>10/5/18</u>
Originator (Sign and Print)	Approval Date
<u>Bruce Grace</u>	<u>10/5/18</u>
Department Curriculum Committee Chair (Sign and Print)	Approval Date

PROGRAM/MINOR/CERTIFICATE

Deletion/Reinstatement for Program or Minor or Certificate

This outline is to be followed for program/minor/certificate deletion or reinstatement.

<input type="checkbox"/>	Program	Title: (as listed in the current catalog)	Economics Minor
<input checked="" type="checkbox"/>	Minor		
<input type="checkbox"/>	Certificate		
<input checked="" type="checkbox"/>	Deletion – Program/Minor/Certificate will be removed and cannot be reinstated.		
<input type="checkbox"/>	Reinstatement - brings back from suspension. Cannot be used if Program/Minor/Certificate has been permanently deleted.		
CIP Code <i>Contact your department chair or associate dean to verify the correct CIP code information.</i>			
52.0601 (Business/Managerial Economics)			

TYPE OF ACTION

I. PROGRAM/MINOR/CERTIFICATE DELETION

*For CPE reporting purposes, a deleted program will be marked as suspended for a minimum of 2 years and a maximum of 5 years to allow for the teach-out plan.

a. Proposed date students are no longer allowed to enroll (students must be allowed to enter the program until after the official closure date):	August 2020
b. Date all students must have completed the teach-out plan:	August 2022
c. Proposed final program/minor/certificate deletion date (Program closures and teach-out plans require approval by SACSCOC. The SACSCOC approval date will determine the official date of closure):	August 2022

II. PROGRAM/MINOR/CERTIFICATE REINSTATEMENT

*Program reinstatement must occur within the suspension period. Prior to submission, you must contact Undergraduate Education and Student Success to determine if reinstatement timelines can be met. All reinstatements must be approved at multiple levels, including SACSCOC. The change will be in effect the catalog year following the SACSCOC approval date.

a. Official suspension date for the program:	
b. Proposed date for reinstatement	

JUSTIFICATION

A. Why is the Program, Minor, or Certificate being deleted or reinstated?

The BBA-Economics program was deleted Fall 2015 (as a result of the 2014 Academic Affairs Self-Study report). With upper division Economics courses only being offered to support the teach-out plan for the BBA-Economics program, the Economics minor can no longer be supported given that the current enrollment in the Economics Minor is only 3 students.

B. List all departments and programs that could be impacted by this proposal. For example, any department or program that:

- a. offers required courses for this program, minor, or certificate
- b. offers elective courses for this program
- c. offers similar courses in their program
- d. has an equated course
- e. has courses in this proposal listed as co-requisite or pre-requisite
- f. shares staff and/or resources.

No departments or programs offer required or elective courses for the Economics Minor. There are no equated courses in the Economics Minor. Economics courses required for all business programs, the MBA program, and MSU General Education will continue to be offered. MSU academic programs that have required Economics courses (other than BBA programs and the MBA program) utilize the ECON 101, ECON 201, or ECON 202 courses. Multiple sections of ECON 201/ECON 202 will continue to be offered every semester, and ECON 101 will be offered at least one semester each year. A sufficient number of Economics courses will be offered each semester to support the BBA program and the MBA program.

C. Explain the potential impact on the other departments and programs.

There is no expected impact on other departments and programs as Economics courses required for all business programs, the MBA program, and MSU General Education will continue to be offered.

D. List the individuals in the other departments and programs notified by the proposing department and define the method of contact (e-mail, phone conversation, etc.)

No other departments or programs needed to be notified as there is no expected impact on other departments and programs.

Your information in the sections E, F, and G below should include all students who have enrolled in the program in the last 5 years (even if they are not a current student). Please contact Institutional Effectiveness for official data.

E. How many students could be impacted?

Current enrollment is only 3 students.

F. What is the impact on students?

A teach out plan has been developed that will permit these students currently enrolled in the Economics Minor to complete program requirements.

G. What is the impact on enrollment?

- a. University
- b. Department
- c. Program

The BBA-Economics program was deleted Fall 2015 (as a result of the 2014 Academic Affairs Self-Study report). With upper division Economics courses only being offered to support the teach-out plan for the BBA-Economics program, the Economics minor can no longer be supported.

Current enrollment in the Economics minor is only 3 students, thus suspending this program has minimal impact on university/school enrollment.

H. What is the impact on staffing:

Economics faculty are used to support all business programs, the MBA program, and MSU General Education, thus there is no staffing impact in deleting this program.

I. How will affected faculty and staff be informed of the impending reinstatement/closure?

A meeting with the affected Economics faculty has been held and this proposed action has also been communicated via email.

TEACH OUT PLAN – (Program closures and teach-out plans require approval by SACSCOC.)

A. Will the teach-out plan require students to incur additional expense? Yes No

If yes, please describe the additional expense, list how much additional expense, and identify how the students will be notified of the additional expense.

A. Please insert the teach-out plan.

A phase out plan has been developed that will permit current Economics minors to complete degree requirements over the next two years. All current Economic minor students will be contacted by the School of Business Administration Associate Dean to develop an individualized curriculum/graduation plan.

B. You must notify all impacted students by U.S. Mail. Please insert a sample of the student notification letter.

Dear _____,

Beginning August 2020, students will no longer be able to enroll as Economics Minors due to low enrollment in the Economics Minor. While no new students will be able to enroll in the Economics Minor beginning August 2020, we are committed to helping all current students enrolled as Economics Minors to complete their degree requirements through August 2022. As such, please contact your academic advisor to discuss what you need to do in order to complete the requirements necessary for the Economics Minor by this time. We wish you all the best and want to fully support you in your academic endeavors.

You are also welcome to contact me with any questions or concerns that you may have. Please contact the Associate Dean's Office to schedule a time to speak with me or email me with any questions that you may have.

Best,
Johnathan Nelson
Interim Associate Dean
School of Business Administration
Elmer R. Smith College of Business

- C. Is this a collaborative or joint program with another institution? Yes No
If so, please attach signed copies of the teach-out agreements with the other institution(s).



SCHOOL OF BUSINESS ADMINISTRATION
MOREHEAD STATE UNIVERSITY
212 COMBS BLDG.
MOREHEAD, KY 40351

MEMORANDUM

TO: MSU Curriculum Committees

FROM: Dr. John Nelson, Interim Associate Dean
School of Business Administration

DATE: September 2018

RE: Type VI Curriculum Proposal – Economics Minor

Attached is a Type VI curriculum proposal in which it is requested that the Economics Minor program be deleted. The BBA-Economics program was deleted beginning the 2015 fall semester due to limited enrollment. The Economics minor has seen very low enrollments for a number of years and it is no longer viable to offer upper division Economics courses to support the Economics Minor with limited faculty resources in the Economics area. No faculty or staffing changes will occur should this proposal be approved.

Teach Out Plan - Economics Minor program

1. Date of Closure

2020 Fall Semester

2. Explanation of how affected parties (students, faculty, staff) will be informed of the impending closure

- Only three students are enrolled in the Economics minor program. The Associate Dean met will meet with these students during the 2019 spring semester and a teach out plan will be developed and shared with the student. From this discussion, the students will develop their course completion plans such that the Economics minor is completed by the 2022 fall semester.
- Several meetings about the Economics Minor program have been held with the Economics faculty over the past several years, convened by the School of Business Administration Associate Dean. These meetings have focused on declining Economics faculty resources and the need to delete the Economics Minor program.
- Staff will be informed of the program suspension through an email message sent by the SBA Associate Dean.

3. How affected students will be helped to complete their programs of study with minimal disruption

Should there be additional Economics minor students of which the Associate Dean is not aware, these students will meet with the SBA Associate Dean during the 2020 spring semester to develop a plan to complete the minor. Courses needed by these students will be offered as shown in the following table.

Course Scheduling Plan

Semester	ECON Courses Offered	Notes
Fall 2020	ECON 341, FIN 373	
Spring 2021	ECON 342, several FIN courses	Can use FIN courses as electives and/or substitutes for needed ECON courses
Fall 2021	ECON 341, FIN 373, several other FIN courses	Can use FIN courses as electives and/or substitutes for needed ECON courses

Spring 2022	ECON 447, several FIN courses	Can use FIN courses as electives and/or substitutes for needed ECON courses
-------------	-------------------------------	---

4. An indication of whether the teach-out plan will incur additional charges/expenses to the students.

No additional charges will be incurred by current students completing this program.

5. Signed copies of teach-out agreements with other institutions.

N/A

6. How faculty and staff will be redeployed or helped to find new employment.

No changes to faculty and staff will occur in deleting the Economics Minor program.



COURSE
Minor Revision to an Existing Course
Undergraduate Curriculum Routing Form
 Revised May 2017

Course (as listed in current catalog)	EEC 400 Digital Signal Processing I
Department (as listed in current catalog)	Engineering and Technology Management
College (as listed in current catalog)	Elmer R. Smith College of Business and Technology

The proposal form language and formatting cannot be altered in any way. If the form has been altered, it will be returned to the initiator for revision.

Please note: it is the initiator's responsibility to track a proposal through the approval process.

Signatures (Signatures must be handwritten; electronic signatures are not accepted.)

The Departmental Curriculum Committee Chair will review and complete the checklist on the next page to indicate their approval.

Departmental Curriculum Committee

Ahmad Zargari Ahmad Zargari Approved () Disapproved 10/29/18
 Department Chair or Associate Dean (Sign and Print) Date

Teame Ghirmay/Teame Ghirmay Approved () Disapproved 10/30/18
 College Curriculum Committee (Sign and Print) Date

Greg Russell Greg Russell Approved () Disapproved 10/30/18
 Dean (Sign and Print) Date

N/A () Approved () Disapproved
 Teacher Ed. Council (if the course is required in any secondary education program) (Sign and Print) Date

Once the proposal has been approved through the above levels, the initiator will route the FINAL paper document to Howell McDowell 204 and submit the FINAL electronic WORD document to undergraduate@moreheadstate.edu (the two documents must be exactly the same).

Laurie Couch Laurie Couch Approved () Disapproved 11/07/18
 Undergraduate Curriculum Committee (Sign and Print) Date

[Signature] () Approved () Disapproved 11-9-18
 Vice President for Academic Affairs (Sign and Print) Date

COVER SHEET

This sheet (including the Checklist) MUST accompany the paper hard copy of the proposal that is routed through the signature process.

Course: (as listed in current catalog)	EEC 400 Digital Signal processing I
Department: (as listed in current catalog)	Engineering and Technology Management
College: (as listed in current catalog)	Elmer R. Smith College of Business and Technology

The proposal form language and formatting cannot be altered in any way. If the form has been altered, it will be returned to the initiator for revision.

Please note: it is the initiator's responsibility to track a proposal through the approval process.

The initiator will review the final document and complete the checkboxes on the left side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the Department Curriculum Committee Chair for their review.

The Department Curriculum Committee Chair will review the document and complete the checkboxes on the right side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the next level.

Initiator	Department Curriculum Committee Chair
<input checked="" type="checkbox"/> The curriculum proposal form has not been altered (formatting, font, etc.).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Grammar, spelling, punctuation, sentence structure, etc. is accurate.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The course title, department, and college names correspond to the current catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Course teaching workload, formula, and semesters taught are specified.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The impacted departments, programs, the individuals notified, and the method of notification are listed.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Responses are complete and applicable for each question.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The entire proposal is saved as one Word document.	<input checked="" type="checkbox"/>

My signature verifies that I have reviewed the proposal and it is ready to go to the next level.

William R. Grisé [WILLIAM R. GRISÉ] 10/29/18
 Originator (Sign and Print) Approval Date

SN [Nitesh Joshi] 10-29-18
 Department Curriculum Committee Chair (Sign and Print) Approval Date

COURSE

Minor Revision to an Existing Course

Use this outline to report a minor modification of a previously approved course and to equate a *current* course with a new course. Minor revisions include title, prefix, course number, catalog course description, and admission requirements (test scores, pre-requisites, or co-requisites). **Minor changes do not modify course content or the course formula.** If the course content or formula is to be modified, use the New Course or Major Revision to Existing Course Form. Terms offered should be consistent with the curriculum map.

I. COURSE						
Current Course Name: <small>(as listed in the current catalog)</small>	Course prefix <small>(Example: ENG)</small>	Number <small>(Example: 100)</small>	Title <small>(Example: Writing I)</small>	Faculty Load	Formula <small>(Example: 3-0-3)</small>	Intended Terms Offered <small>(Example: Fall/Spring)</small>
	EEC	400	Digital Signal Processing I	3.47	2-2-3	Fall
Proposed Course Name:	Course prefix <small>(Example: ENG)</small>	Number <small>(Example: 100)</small>	Title <small>(Example: Writing I)</small>	Faculty Load	Formula <small>(Example: 3-0-3)</small>	Intended Terms Offered <small>(Example: Fall/Spring)</small>
	EEC	400	Digital Signal Processing I	3.47	2-2-3	Fall

II. EXPLANATION

A. Describe the change and justify what this proposal is requesting; what are you doing and why are you doing it? Content will be listed at the end of the document.

Minor changes are being made to the course prerequisites as shown in section III.A below. The objective is to make the course available to Space Science Area students without having to take the currently required prerequisite. There is no change to the course content.

B. List all other departments and programs that could be impacted by this proposal. For example, any department or program that:

- a. Requires the course
- b. Has an equated course
- c. Shares staff and/or resources

Space Science Area - Bachelor of Science

C. Explain the potential impact on the other departments and programs.

EEC 400 is a required course for the Space Science Area. Space Science students will not have taken EEC 344 (the current pre-requisite). So, we are adding SSE 340 as an optional pre-requisite.

D. List the individuals in the other departments and programs notified by the proposing department and define the method of contact (e-mail, phone conversation, etc.)

Dr. Eric Jerde, Chair of the Earth and Space Sciences Department, and Dr. Ahmad Zargari, Associate Dean of the School of Engineering and Information Systems, have had discussions and have jointly initiated this proposal.

III. ADDITIONAL INFORMATION

A. If this is a change that effects the current MSU Undergraduate Catalog content, please provide the copy that is to appear in the next catalog revision.

(2-2-3) This course provides an introduction to the exciting world of signal processing. Upon completion the student will be familiar with the fundamentals of DSP methods and applications using the interactive MATLAB signal processing tool box. Designed for students who have some basic familiarity with electric signal analysis.

Prerequisite: EEC 344 OR SSE 340
Corequisite: EEC 400L

Please insert (paste) any supporting documentation here. If you have no supporting information, please remove this section from your proposal.



PROGRAM
Minor Revision to an Existing Program
Undergraduate Curriculum Routing Form

Revised January 2018

Program: (as listed in current catalog)	Engineering Technology Area – Bachelor of Science
Department: (as listed in current catalog)	Engineering and Technology Management
College (as listed in current catalog)	Elmer R. Smith College of Business and Technology

The proposal form language and formatting cannot be altered in any way. If the form has been altered, it will be returned to the initiator for revision.

Please note: it is the initiator's responsibility to track a proposal through the approval process.

Signatures (Signatures must be handwritten; electronic signatures are not accepted.)

The Departmental Curriculum Committee Chair will review and complete the checklist on the next page to indicate their approval.

Departmental Curriculum Committee

Ahmad Zargar Ahmad Zargar Approved () Disapproved 9-13-2018
 Department Chair or Associate Dean (Sign and Print) Date

Teame Ghirmay Teame Ghirmay Approved () Disapproved 10-02-2018
 College Curriculum Committee (Sign and Print) Date

Greg Russell Greg Russell Approved () Disapproved 10/2/18
 Dean (Sign and Print) Date

N/A () Approved () Disapproved
 Teacher Ed. Council (if program is a secondary education program) (Sign and Print) Date

Once the proposal has been approved through the above levels, the initiator will route the FINAL paper document to Howell McDowell 204 and submit the FINAL electronic WORD document to undergraduate@moreheadstate.edu (the two documents must be exactly the same).

Laurie Couch Laurie Couch Approved () Disapproved 11/07/18
 Undergraduate Curriculum Committee (Sign and Print) Date

[Signature] Approved () Disapproved 11-9-18
 Vice President for Academic Affairs (Sign and Print) Date

COVER SHEET

This sheet (including the Checklist) MUST accompany the paper hard copy of the proposal that is routed through the signature process.

Program: (as listed in current catalog)	Engineering Technology Area – Bachelor of Science
Department: (as listed in current catalog)	Engineering and Technology Management
College: (as listed in current catalog)	Elmer R. Smith College of Business and Technology

Helpful Information:

1. Any proposal with a secondary education component must be routed through the Teacher Education Council.
2. Edits to the proposal may be requested at any level of review. Such edits should be made by the originator of the proposal. The originator also may be asked to address questions (in writing or in person) at any level of review.

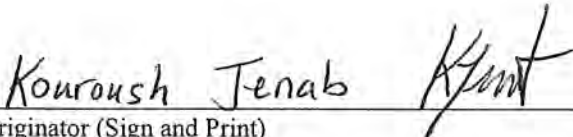
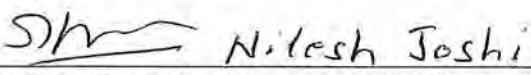
CHECKLIST

The initiator will review the final document and complete the checkboxes on the left side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the Department Curriculum Committee Chair for their review.

The Department Curriculum Committee Chair will review the document and complete the checkboxes on the right side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the next level.

Initiator	Department Curriculum Committee Chair
<input checked="" type="checkbox"/> The curriculum proposal form has not been altered (formatting, font, etc.).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> If a Teacher Education Council signature is required, the next approval level will be notified so that it can be obtained.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Grammar, spelling, punctuation, sentence structure, etc. is accurate.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The title, department, and college names correspond to the current catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The impacted departments, programs, the individuals notified, and the method of notification are listed.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Responses are complete and applicable for each question.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Each course pre-fix, number, and title is consistent with the current undergraduate catalog (or with revisions made in supporting curriculum proposals).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> The entire proposal is saved as one Word document.	<input checked="" type="checkbox"/>

My signature verifies that I have reviewed the proposal and it is ready to go to the next level.

<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  Kouroush Jenab Originator (Sign and Print) </div> <div style="text-align: right;"> 09/12/2018 Approval Date </div> </div>
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  Nitesh Joshi Department Curriculum Committee Chair (Sign and Print) </div> <div style="text-align: right;"> 09/12/18 Approval Date </div> </div>

PROGRAM

Minor Revision to an Existing Program

The following outline is to be used to report a minor modification of a previously approved program. *If the program content or method of instruction is to be modified, use the "Major Revision of an Existing Program" form.* Minor changes may include a change in program title or minor admission or completion requirements which *do not modify program content*. Please list each program change on a separate proposal form.

I. PROGRAM INFORMATION

State the current title of the program (as listed in the current catalog)

Engineering Technology Area – Bachelor of Science
 Track 1: Electronics and Computer Engineering Technology
 Track 2: Mechanical and Manufacturing Engineering Technology
 Track 3: Construction Management and Civil Engineering Technology

State the proposed revised title of the program (if applicable)

N/A

CIP Code - *Contact your department chair or associate dean to verify the correct CIP code information.*

B15.0000

II. EXPLANATION

A. Describe the change and justify what this proposal is requesting; what you are doing and why are you doing it? Content will be listed at the end of the document.

The program requirements states that students are required to obtain a grade of "C" or better in all technical courses for the following tracks:

Track 1: Electronics and Computer Engineering Technology
 Track 2: Mechanical and Manufacturing Engineering Technology
 Track 3: Construction Management and Civil Engineering Technology

However, the department has decided to lift the grade requirement for all technical courses because it has no significant impact on the program accreditation, quality, and enrollment. This decision will enhance student retention and make the program consistent with other programs in the department.

B. List all departments and programs that could be impacted by this proposal. For example, any department or program that:

- a. offers required courses for this program
- b. offers elective courses for this program
- c. offers similar courses in their program
- d. has an equated course
- e. has courses in this proposal listed as a co-requisite or pre-requisite
- f. shares staff and/or resources.

This change has no impact on other departments and programs.

C. Explain the potential impact on the other departments and programs.

None

D. List each of the individuals in the other departments and programs notified by the proposing department and define the method of contact (e-mail, phone conversation, etc.)

N/A

E. If this is a change that affects the current MSU Undergraduate Catalog content, please provide the copy that is to appear in the next catalog revision.

Remove "Students are required to obtain a grade of "C" or better in all technical courses." from Program Requirements for all tracks of Engineering Technology Areas as follows:

Track 1: Electronics and Computer Engineering Technology
 Track 2: Mechanical and Manufacturing Engineering Technology
 Track 3: Construction Management and Civil Engineering Technology



COURSE

New Course or Major Revision to Existing Course Undergraduate Curriculum Routing Form

Revised May 2017 January 2018

This is a New Course Revised Course

Course: (if revision, as listed in current catalog)	ETM 317 Systems Modeling and Simulation
Department: (as listed in current catalog)	Engineering and Technology Management
College: (as listed in current catalog)	Elmer R. Smith College of Business and Technology

The proposal form language and formatting cannot be altered in any way. If the form has been altered, it will be returned to the initiator for revision.

Please note: it is the initiator's responsibility to track a proposal through the approval process.

Signatures (Signatures must be handwritten; electronic signatures are not accepted.)

If question F1 or F2 in section V is answered yes, then you (the initiator) must have a representative from Information Technology (GH 201) sign the signature sheet before it is submitted to the department curriculum committee.

N/A

() Approved () Disapproved

Information Technology Resources Are Available (Sign and Print)

Date

The Departmental Curriculum Committee Chair will review and complete the checklist on the next page to indicate their approval.
Departmental Curriculum Committee

Ahmad Zargari Ahmad Zargari () Approved () Disapproved
Department Chair or Associate Dean (Sign and Print)

9-13-18

Date

Teame Ghirmay Teame Ghirmay () Approved () Disapproved
College Curriculum Committee (Sign and Print)

10-02-2018

Date

Greg Russell Greg Russell () Approved () Disapproved
Dean (Sign and Print)

10/2/18

Date

N/A

() Approved () Disapproved

Teacher Ed. Council (if the course is required in any secondary education program) (Sign and Print)

Date

Once the proposal has been approved through the above levels, the initiator will route the FINAL paper document to Howell McDowell 204 and submit the FINAL electronic WORD document to undergraduate@moreheadstate.edu (the two documents must be exactly the same).

Laurie Couch Laurie Couch () Approved () Disapproved
Undergraduate Curriculum Committee (Sign and Print)

11/07/18

Date

B. A. M. M. () Approved () Disapproved
Vice President for Academic Affairs (Sign and Print)

11-9-18

Date

COVER SHEET

This sheet (including the Checklist) MUST accompany the paper hard copy of the proposal that is routed through the signature process.

Course: (as listed in current catalog)	ETM 317 Systems Modeling and Simulation
Department: (as listed in current catalog)	Engineering and Technology Management
College: (as listed in current catalog)	Elmer R. Smith College of Business and Technology

The proposal form language and formatting cannot be altered in any way. If the form has been altered, it will be returned to the initiator for revision.

Please note: it is the initiator's responsibility to track a proposal through the approval process.

The initiator will review the final document and complete the checkboxes on the left side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the Department Curriculum Committee Chair for their review.

The Department Curriculum Committee Chair will review the document and complete the checkboxes on the right side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the next level.

Initiator	Department Curriculum Committee Chair	
<input checked="" type="checkbox"/>	The curriculum proposal form has not been altered (formatting, font, etc.).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	If an Information Technology signature is required, it has been obtained.	<input type="checkbox"/>
<input checked="" type="checkbox"/>	If a Teacher Education Council signature is required, the next approval level will be notified so that it can be obtained.	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Grammar, spelling, punctuation, sentence structure, etc. is accurate.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The course title, department, and college names correspond to the current catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Course teaching workload, formula, and semesters taught are specified.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The course description EXACTLY matches the course description stated in the syllabus.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The impacted departments, programs, the individuals notified, and the method of notification are listed.	<input checked="" type="checkbox"/>
	Impact is defined as any program or department that requires the course, offers the course as an elective, offers a similar course, has an equated course, has the course listed as a co-requisite or pre-requisite, shares staff and/or resources.	
<input checked="" type="checkbox"/>	Responses are complete and applicable for each question.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	If the course requires the use of live animals, the IACUC form is attached.	<input type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus starts on a separate page.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains a heading to reflect "Morehead State University" as well as college, school, and/or department.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the course title and course number (exactly as listed in the proposal).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the academic term with date.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the instructor's name.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the office location.	<input checked="" type="checkbox"/>

<input checked="" type="checkbox"/>	The syllabus contains the instructor's office phone number and office hours schedule.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the email address and URL for the instructor's personal web site, if applicable.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the revised course description and it exactly matches the course description on the proposal. If there is no revision to the course description, it exactly matches the course description in the current catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the intended student learning outcomes related to program objectives as specified in the catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the methods by which the achievement of each student learning outcome listed on the syllabus will be measured. List each activity and the assessment method for that activity. For example: 1. Students will write a term paper; scored by a rubric; or 2. Students will complete an exam; objective test.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains a week by week or day by day course calendar with specific content, assignments and/or exams highlighted.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains a grading description and distribution (please be very specific).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains a course attendance policy (please be very specific and ensure compliance with UAR 131.01).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the following Campus Safety Statement: Campus Safety Statement Emergency response information will be discussed in class. Students should familiarize themselves with the nearest exit routes in the event evacuation becomes necessary. You should notify your instructor at the beginning of the semester if you have special needs or will require assistance during an emergency evacuation. Students should familiarize themselves with emergency response protocols at: http://www.moreheadstate.edu/emergency/	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the following academic honesty policy: Academic honesty: All students at Morehead State University are required to abide by accepted standards of academic honesty. Academic honesty includes doing one's own work, giving credit for the work of others, and using resources appropriately. Guidelines for dealing with acts of academic dishonesty can be found in the academic catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the following policy for accommodating students with disabilities: Americans with Disabilities Act (ADA) Students with disabilities are entitled to academic accommodations and services to support their access and safety. The Office for Disability Services in 109-J Enrollment Services Center coordinates reasonable accommodations for students with documented disabilities. Although a request may be made at any time, services are best applied when they are requested at or before the start of the semester. Please contact Disability Services at 606-783-5188 or e.day@moreheadstate.edu or visit their website at www.moreheadstate.edu/disability .	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The entire proposal is saved as one Word document.	<input checked="" type="checkbox"/>

My signature verifies that I have reviewed the proposal and it is ready to go to the next level.

Kouroush Jenab Kfamt
Originator (Sign and Print)

09/12/2018
Approval Date

Shr Nitesh Joshi
Department Curriculum Committee Chair (Sign and Print)

09/12/18
Approval Date

COURSE

New Course or Major Revision to Existing Course

This outline is to be used when a new course is proposed or when a major change is proposed to an existing course. If you are preparing a *new* experimental course/workshop proposal, please use the New Experimental Course/Workshop form. This outline is not to be used for General Education Courses. Refer to the General Education web site.

I. COURSE INFORMATION

- The course title should only be 30 characters.
- The following are definitions of terms related to courses:
 - **Petition required** – requires permission from the Department Chair to enroll in a section of the course.
 - **Equated** – two different courses with the same content at the same level with different prefixes.
 - **Restricted** – program admission is required and/or must have Department Chair approval.
 - **Formula** – (3-0-3) = instruction hours – lab hours – credit hours

This is a **New Course** **Revised Course**

Course Name <small>(as listed in the current catalog)</small>	Course prefix <small>(Example: ENG)</small>	Number <small>(Example: 100)</small>	Title <small>(Example: Writing I)</small>	Formula <small>(Example: 3-0-3)</small>	Faculty Load <small>(Contact your Department Chair or Dean's Office for assistance)</small>	Intended Terms Offered <small>(Example: Fall/Spring)</small>
	ETM	317	Systems Modeling and Simulation	3-0-3	3.0	Fall/Spring
Proposed Course Name:	Course prefix <small>(Example: ENG)</small>	Number <small>(Example: 100)</small>	Title <small>(Example: Writing I)</small>	Formula <small>(Example: 3-0-3)</small>	Faculty Load <small>(Contact your Department Chair or Dean's Office for assistance)</small>	Intended Terms Offered <small>(Example: Fall/Spring)</small>
	ETM	317	Systems Modeling and Simulation	3-0-3	3.0	Fall/Spring

Approved major or program(s) in which the course will be offered. (as listed in the current catalog)

Engineering Management Area – Bachelor of Science
 Engineering Technology Area – Bachelor of Science
 Technology Management Area – Bachelor of Science
 Industrial Education Area – Bachelor of Science

This is a **required course.** This is an **elective course.**

Course Description Course description *exactly as it will appear in the catalog and as it appears on the sample syllabus.* Include pre-requisites/co-requisites, petition requirements, course equations, restrictions and term(s) offered. Example: XYZ 288. Guidelines for a New Course. (3-0-3) Fall and Spring; petition required. A study of the impact of technology on individuals, society, and the environment. Equated with ABC 288.

ETM 317 Systems Modeling and Simulation (3-0-3) This course is designed to study both discrete/continuous and deterministic/stochastic processes in order to demonstrate and apply core engineering principles and concepts to solve engineering problems. These include formulating and implementing simulation models, analysis of input and output data, statistical techniques for models of single systems and competing alternative systems. Computer simulation languages will be introduced.

Prerequisite: ETM 120, MATH 175 OR MATH 275 OR MATH 353 OR MATH 365.

II. PURPOSE, GOALS AND OBJECTIVES

A. What are the goals and objectives of the proposal? Explain why you are proposing a new course or why and how you are revising a current course.

The course description, prerequisites, and objectives need to be aligned in order to prepare the students to apply core engineering principles and concepts to solve engineering problems. This revision is necessary in order to meet the program's accreditation requirements. Therefore, the department of Engineering and Technology Management has revised the ETM 317 course to address the programs accreditation requirements and student learning objectives.

B. Justify the proposed instructional level (100-600) or instructional level change.

This is a 300 level course and no change is required.

C. List the student learning outcomes for the course.

1. Demonstrate and apply core engineering principles and concepts to solve engineering problems.
2. Use relevant computer simulation and visualization software.

3. Determine the data that are appropriate to collect; group information and data; design experiments and investigations.
4. Conduct statistical processing/modeling of experimental data.
5. Construct hypothesis or problem statement consistent with the information available and the constraints/parameters of the problem.
6. Evaluate the feasibility of alternatives or proposed solutions.
7. Describe the differences between different evaluation methods, select and apply proper evaluation methods at an appropriate point in a design project; analyze results of the evaluation to discern additional criteria; rank/rate alternatives based on evaluation results.
8. Select the best alternative and proceeds with the design.
9. Apply statistical procedures; understand the need to consider results from different viewpoints and audiences.
10. Manage own time and process effectively to achieve personal and team goals.
11. Listen and appropriately respond to verbal questions and instructions.
12. Illustrate concepts in graphical form.
13. Understand/establish project scope and desired deliverables; plan tasks, allocate responsibilities, and set timelines to meet project goals.

D. Describe how those student learning outcomes will be assessed. List each activity and the assessment method for that activity. For example: 1. Students will write a term paper; scored by a rubric; **or**

2. Students will complete an exam; objective test.

1. Demonstrate and apply core engineering principles and concepts to solve engineering problems. (Assessed in Discussion Board 1, rubric, Assignment 1, objective test)
2. Use relevant computer simulation and visualization software. (Assessed in Assignment 2, objective test)
3. Determine the data that are appropriate to collect; group information and data; design experiments and investigations. (Assessed in Individual Project, rubric)
4. Conduct statistical processing/modeling of experimental data. (Assessed in Discussion Board 2, rubric, Assignment 2, objective test)
5. Construct hypothesis or problem statement consistent with the information available and the constraints/parameters of the problem. (Assessed in Discussion Board 3, Assignments 3 &4, rubric, Individual Project, rubric)
6. Evaluate the feasibility of alternatives or proposed solutions. (Assessed in Individual Project, rubric)
7. Describe the differences between different evaluation methods, select and apply proper evaluation methods at an appropriate point in a design project; analyze results of the evaluation to discern additional criteria; rank/rate alternatives based on evaluation results. (Assessed in Individual Project, rubric)
8. Select the best alternative and proceeds with the design. (Assessed in Individual Project, rubric, Discussion Board 4, rubric, Assignment 5, objective test)
9. Apply statistical procedures; understand the need to consider results from different viewpoints and audiences. (Assessed in Individual Project, rubric, Discussion Board 5, rubric)
10. Manage own time and process effectively to achieve personal and team goals. (Assessed in Individual Project, rubric)
11. Listen and appropriately respond to verbal questions and instructions. (Assessed in Individual Project, rubric)
12. Illustrate concepts in graphical form. (Assessed in Individual Project, rubric)
13. Understand/establish project scope and desired deliverables; plan tasks, allocate responsibilities, and set timelines to meet project goals. (Assessed in Individual Project, rubric)

E. Define how the course helps students to achieve learning objectives required for the program.

All programs of the Department of Engineering and Technology Management will prepare students for highly specialized technology careers to solve engineering problems, or to continue their education in graduate school. The ETM 317 Systems Modeling and Simulation course (3-0-3) is designed to study both discrete/continuous and deterministic/stochastic processes in order to prepare students for applying core engineering principles and concepts to solve engineering problems.

F. Explain how the specific goals and objectives of the course relate to the mission statement of the University.

This course will enhance the students knowledge for success in a global environment, engage in scholarship, and serve the community by improving their capabilities to apply core engineering principles and concepts to solve engineering problems.

III. IMPACT

A. List any existing course(s) that will be replaced by the proposed/revised course.

None

B. List other courses now offered at MSU that will have duplication or overlap. Explain the degree to which the course duplicates or overlaps and provide justification for the duplication or overlap.

None

C. List departments and programs that could be impacted by this proposal. For example, any

department that:

- a. requires the course
- b. offers the course as an elective
- c. offers a similar course
- d. has an equated course
- e. has the course listed as a co-requisite or pre-requisite
- f. shares staff and/or resources

The Department of Mathematics and Physics will be impacted because of the following course prerequisite: MATH 353 OR MATH 365.

D. List each of the individuals notified by the proposing department chair and define the method of contact (e-mail, phone conversation, etc.)

Prof. Christopher Schroeder, Chair
Department of Mathematics & Physics
c.schroeder@moreheadstate.edu
Email date: 09/12/2018

IV. PERSONNEL

A. List names, qualifications including the highest earned degree, and academic rank(s), of faculty available to MSU who will teach the course.

Kouroush Jenab, Ph.D. in Mechanical Engineering, Ph.D. in Industrial Engineering, Assistant Professor

B. Identify external adjunct faculty, if appropriate.

N/A

V. ADDITIONAL INFORMATION

A. Desired section size and anticipated enrollment.

Section size: 40 students, Anticipated enrollment: 35 students

B. Desired implementation date for the course.

Fall 2019

C. Method of instruction (online, lecture, laboratory, individualized, etc.).

Lecture/Online/Hybrid

D. Additional facilities and special equipment needs for this course, if any.

None

E. Use of library resources

It is recommended that you contact a library liaison prior to completing this section to determine what resources and services are available to support the course.

- Does the course require library resources to support specific class assignments or supplemental reading? Yes No
- Do the library services and resources presently available meet student needs for the course? Yes No

If not, what library acquisitions are being proposed to meet essential needs?

F. Does this course require new technology?

Please note that Information Technology (GH 110) should be notified when the course proposal is being developed. Early notification will allow IT an opportunity to provide quality information that can be included in the proposal request form.

- Yes (If yes, you must have a representative from Information Technology review the proposal and sign the signature sheet.)
- No

If yes, please list:

1. the software to be used and its estimated cost. If there is intent to utilize the software in a lab, include the estimated cost of the server-based license for the software. (IT does not install individual packages in labs, only server-based versions).

2. the type of hardware to be utilized.

G. Does this course involve the use of live animals? Yes No

If so, include the approval form from the associated Institutional Animal Care and Use Committee (IACUC).

H. Please include a sample syllabus (must start on new page). *All elements on the syllabus checklist must be included on the sample syllabus* (syllabus checklist attached).

- Proposals for all Teacher Education courses (including content courses that typically have 50% more teacher preparation majors enrolled) are required to go to the Teacher Education Committee as part of the curriculum approval process
- The teacher education syllabi must contain these elements: the theme for MSU's Teacher Education Program; CAEP* themes; any additional EPSB themes; and program appropriate Kentucky Teacher Standards (www.kyepsb.net/teacherprep/standards.asp). Further information and models are provided at <http://www.moreheadstate.edu/education/>.
- *The College of Education (CoE) is NCATE accredited. NCATE and TEAC have combined to form CAEP, a new national accrediting organization. Educator Preparation Programs, including the CoE at MSU are in the process of transitioning from NCATE to CAEP and as such, we are working to transition to align our programs with CAEP standards and requirements in anticipation of our next accreditation visit in 2018, at which time we will fall fully under CAEP standards and guidelines. For more information on CAEP and the new accreditation process, please see www.caepnet.org.



ETM 317
Systems Modeling and Simulation
Course Syllabus
Fall 2019

Department of Engineering and Technology Management
School of Engineering and Information Systems
Morehead State University

Course Description

ETM 317 Systems Modeling and Simulation course (3-0-3) This course is designed to study both discrete/continuous and deterministic/stochastic processes in order to demonstrate and apply core engineering principles and concepts to solve engineering problems. These include formulating and implementing simulation models, analysis of input and output data, statistical techniques for models of single systems and competing alternative systems. Computer simulation languages will be introduced.

Prerequisite: ETM 120, MATH 175 OR MATH 275 OR MATH 353 OR MATH 365.

Instructor

Kouroush Jenab
209 Lloyd Cassity Building Morehead
State University Tel: (606)-783-9339
E-mail: k.jenab@moreheadstate.edu

Class Time: TBD

Note: The online section is for Technology Management students only, unless with valid approval from advisor/instructor.

Office Hours: TBD

Required Textbook

Discrete-Event System Simulation, 5th Edition
Jerry Banks, John S. Carson, II; Barry L. Nelson; David M. Nicol Prentice Hall, 2010
ISBN-10: 0136062121
ISBN-13: 9780136062127

Supplementary Textbook

- 1- Simulation Modeling and Analysis, Law and Kelton, McGraw-Hill, 2000.
- 2- Process Analysis and Improvement, M.S. Seppanen, S. Kumar, C. Chandra, McGraw-Hill, 2005.
- 3- Simulation With Arena, 4th Edition, W.D. Kelton, R.P. Sadowski, D.T. Sturrock, McGraw-Hill, 2007.

Course Objectives

At the end of this course, the successful student will be able to:

1. Demonstrate and apply core engineering principles and concepts to solve engineering problems. (Assessed in Discussion Board 1, rubric, Assignment 1, objective test).
2. Use relevant computer simulation and visualization software. (Assessed in Assignment 2, objective test)
3. Determine the data that are appropriate to collect; group information and data; design experiments and investigations. (Assessed in Individual Project, rubric)

4. Conduct statistical processing/modeling of experimental data. (Assessed in Discussion Board 2, rubric, Assignment 2, objective test)
5. Construct hypothesis or problem statement consistent with the information available and the constraints/parameters of the problem. (Assessed in Discussion Board 3, Assignments 3 &4, rubric, Individual Project, rubric)
6. Evaluate the feasibility of alternatives or proposed solutions. (Assessed in Individual Project, rubric)
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8. Select the best alternative and proceeds with the design. (Assessed in Individual Project, rubric, Discussion Board 4, rubric, Assignment 5, objective test)
9. Apply statistical procedures; understand the need to consider results from different viewpoints and audiences. (Assessed in Individual Project, rubric, Discussion Board 5, rubric)
10. Manage own time and process effectively to achieve personal and team goals. (Assessed in Individual Project, rubric)
11. Listen and appropriately respond to verbal questions and instructions. (Assessed in Individual Project, rubric)
12. Illustrate concepts in graphical form. (Assessed in Individual Project, rubric)
13. Understand/establish project scope and desired deliverables; plan tasks, allocate responsibilities, and set timelines to meet project goals. (Assessed in Individual Project, rubric)

Course Requirements

1. **Attendance:** In order to earn the points assigned for class participation, students must be present in all sessions of the class and must be actively involved in ALL activities including the online DISCUSSION BOARD and INDIVIDUAL PROJECTS.
2. **Student Information Blog Page:** Students are to complete their information blog page in Black board. Instructions for this assignment will be posted during the first week. The due date for this assignment will be announced by the instructor.
3. **Discussion Board:** Students are required to participate constructively in all discussion board activities in order to earn the points assigned for discussion board activities. At the beginning of each week, the instructor will inform students of the due dates for discussion board. No posts to the discussion board will be accepted after the announced due date.
4. **Assignments/Project:** Each student will be required to submit individual projects/assignments that will be assigned and posted by the instructor. Each individual project/assignment must be submitted on the specified due date. Projects/assignments submitted after the due date will be reduced one letter grade for each week past the due date. Should a student need to miss an assignment, the instructor must be consulted beforehand. MSU's excused absences fall into five categories: 1) University sponsored activities; 2) Student/Family illness/death; 3) Military obligations; 4) Jury duty or subpoena for court appearances, or 5) Major religious holidays.
5. **Exams:** **There will be one exam during the semester and a FINAL EXAM. There will be no makeup exams. There is no substitute for any exams. Should a student need to miss an exam, the instructor must be consulted beforehand. Otherwise, it is not accepted and the student will not receive any credit for that exam.** MSU's excused absences fall into five categories: 1) University sponsored activities; 2) Student/family illness/death; 3) Military obligations; 4) Jury duty or subpoena for court appearances, and 5) Major religious holidays. The scores/grades earned in each exam in the course including the final exam, form a significant part of the student's overall grade. To that end, students are encouraged to utilize all the study resources available for the course to prepare adequately for each exam.

Evaluation:

Activity	Point
Attendance and Participation	50
Personal Information Blog	20
Discussions Board (5)	50
Assignments (5)	300
Exam	100
Project	200
Final Exam	280
TOTAL	1000

Note: 90 – 100% = A; 80 – 89% = B, 70 – 79% = C, 60 – 69% = D, Below 60% = E

ACADEMIC HONESTY: Cheating, fabrication, plagiarism or helping others to commit these acts will not be tolerated. Academic dishonesty will result in severe disciplinary action including, but not limited to, failure of the student assessment item or course, and/or dismissal from MSU. If you are not sure what constitutes academic dishonesty, read The Eagle: Student Handbook or ask your instructor. The policy is located at <http://www.morehead-st.edu/units/studentlife/handbook/academicdishonesty.html>.

For example: Copying information from the Internet is plagiarism if appropriate credit is not given.

Americans with Disabilities Act (ADA): Students with disabilities are entitled to academic accommodations and services to support their access and safety. The Office for Disability Services in 202 ADUC coordinates reasonable accommodations for students with documented disabilities. Although a request may be made at any time, services are best applied when they are requested at or before the start of the semester. Please contact Disability Services at 606-783-5188 or e.day@moreheadstate.edu or visit their website at www.moreheadstate.edu/disability for more information.

CAMPUS SAFETY STATEMENT: Emergency response information will be discussed in class. Students should familiarize themselves with the nearest exit routes in the event evacuation becomes necessary. You should notify your instructor at the beginning of the semester if you have special needs or will require assistance during an emergency evacuation. Students should familiarize themselves with emergency response protocols at www.moreheadstate.edu/emergency.

CONTINGENCY PLAN: In case of an emergency that may impact classes, students are expected to contact Blackboard for an announcement by the instructor.

Course Outline (Subject to change):

- 1.Introduction to Simulation (Week 1)
- 2.Analytical Models and Simulation Models (Week 2-3)
- 3.Modeling Input Process
 - (1) Generating Random Numbers (Week 4)
 - (2) Identifying and Testing the Fit of a Distribution (Week 5-6)
- 4.Some Simulation Techniques
 - (1) Spreadsheet Simulations (Week 7)
 - (2) Manual Discrete Event Simulation (Week 8)

Exam (Week 9)

- 5. Simulation Modelling with Arena and Flexsim
 - (1) Creation, Process, Movement, and Termination (Week 10)
 - (2) Modelling Multiple, Parallel Servers (Week 11)
 - (3) Modelling with Probability Distributions (Week 12)
- 6. Experimental Design for Simulation
 - (1) Single-system Models (Week 13)
 - (2) Models of Competing Alternatives (Week 14)
- Project Presentation (Week 15)
- Final Exam (Week 16)

NOTE: This syllabus is subject to change at the discretion of the instructor to accommodate student and/or instructional needs. Changes will be announced through Blackboard.



COURSE

New Course or Major Revision to Existing Course Undergraduate Curriculum Routing Form

Revised May 2017

This is a New Course Revised Course

Course: (if revision, as listed in current catalog)	ETM 319 Quality and Reliability Engineering
Department: (as listed in current catalog)	Engineering and Technology Management
College: (as listed in current catalog)	Elmer R. Smith College of Business and Technology

The proposal form language and formatting cannot be altered in any way. If the form has been altered, it will be returned to the initiator for revision.

Please note: it is the initiator's responsibility to track a proposal through the approval process.

Signatures (Signatures must be handwritten; electronic signatures are not accepted.)

If question F1 or F2 in section V is answered yes, then you (the initiator) must have a representative from Information Technology (GH 201) sign the signature sheet before it is submitted to the department curriculum committee.

N/A

() Approved () Disapproved

Information Technology Resources Are Available (Sign and Print)

Date

The Departmental Curriculum Committee Chair will review and complete the checklist on the next page to indicate their approval.
Departmental Curriculum Committee

Department Chair or Associate Dean (Sign and Print)

Approved () Disapproved

9-13-2018
Date

College Curriculum Committee (Sign and Print)

Approved () Disapproved

10-02-2018
Date

Dean (Sign and Print)

Approved () Disapproved

10-2-18
Date

N/A

() Approved () Disapproved

Teacher Ed. Council (if the course is required in any secondary education program) (Sign and Print)

Date

Once the proposal has been approved through the above levels, the initiator will route the FINAL paper document to Howell McDowell 204 and submit the FINAL electronic WORD document to undergraduate@moreheadstate.edu (the two documents must be exactly the same).

Undergraduate Curriculum Committee (Sign and Print)

Approved () Disapproved

11/07/18
Date

Vice President for Academic Affairs (Sign and Print)

Approved () Disapproved

11-9-18
Date

COVER SHEET

This sheet (including the Checklist) MUST accompany the paper hard copy of the proposal that is routed through the signature process.

Course: (as listed in current catalog)	ETM 319 Quality and Reliability Engineering
Department: (as listed in current catalog)	Engineering and Technology Management
College: (as listed in current catalog)	Elmer R. Smith College of Business and Technology

The proposal form language and formatting cannot be altered in any way. If the form has been altered, it will be returned to the initiator for revision.

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The initiator will review the final document and complete the checkboxes on the left side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the Department Curriculum Committee Chair for their review.

The Department Curriculum Committee Chair will review the document and complete the checkboxes on the right side of the page, sign and date the Cover Sheet, and submit the paper hard copy of the complete proposal to the next level.

Initiator	Department Curriculum Committee Chair	
<input checked="" type="checkbox"/>	The curriculum proposal form has not been altered (formatting, font, etc.).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	If an Information Technology signature is required, it has been obtained.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	If a Teacher Education Council signature is required, the next approval level will be notified so that it can be obtained.	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Grammar, spelling, punctuation, sentence structure, etc. is accurate.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The course title, department, and college names correspond to the current catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Course teaching workload, formula, and semesters taught are specified.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The course description EXACTLY matches the course description stated in the syllabus.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The impacted departments, programs, the individuals notified, and the method of notification are listed.	<input checked="" type="checkbox"/>
	Impact is defined as any program or department that requires the course, offers the course as an elective, offers a similar course, has an equated course, has the course listed as a co-requisite or pre-requisite, shares staff and/or resources.	
<input checked="" type="checkbox"/>	Responses are complete and applicable for each question.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	If the course requires the use of live animals, the IACUC form is attached.	<input checked="" type="checkbox"/> NA
<input checked="" type="checkbox"/>	The syllabus starts on a separate page.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains a heading to reflect "Morehead State University" as well as college, school, and/or department.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the course title and course number (exactly as listed in the proposal).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the academic term with date.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the instructor's name.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the office location.	<input checked="" type="checkbox"/>

<input checked="" type="checkbox"/>	The syllabus contains the instructor's office phone number and office hours schedule.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the email address and URL for the instructor's personal web site, if applicable.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the revised course description and it exactly matches the course description on the proposal. If there is no revision to the course description, it exactly matches the course description in the current catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the intended student learning outcomes related to program objectives as specified in the catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the methods by which the achievement of each student learning outcome listed on the syllabus will be measured. List each activity and the assessment method for that activity. For example: 1. Students will write a term paper; scored by a rubric; or 2. Students will complete an exam; objective test.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains a week by week or day by day course calendar with specific content, assignments and/or exams highlighted.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains a grading description and distribution (please be very specific).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains a course attendance policy (please be very specific and ensure compliance with UAR 131.01).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the following Campus Safety Statement: Campus Safety Statement Emergency response information will be discussed in class. Students should familiarize themselves with the nearest exit routes in the event evacuation becomes necessary. You should notify your instructor at the beginning of the semester if you have special needs or will require assistance during an emergency evacuation. Students should familiarize themselves with emergency response protocols at: http://www.moreheadstate.edu/emergency/	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the following academic honesty policy: Academic honesty: All students at Morehead State University are required to abide by accepted standards of academic honesty. Academic honesty includes doing one's own work, giving credit for the work of others, and using resources appropriately. Guidelines for dealing with acts of academic dishonesty can be found in the academic catalog.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The syllabus contains the following policy for accommodating students with disabilities: Americans with Disabilities Act (ADA) Students with disabilities are entitled to academic accommodations and services to support their access and safety. The Office for Disability Services in 109-J Enrollment Services Center coordinates reasonable accommodations for students with documented disabilities. Although a request may be made at any time, services are best applied when they are requested at or before the start of the semester. Please contact Disability Services at 606-783-5188 or e.day@moreheadstate.edu or visit their website at www.moreheadstate.edu/disability .	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	The entire proposal is saved as one Word document.	<input checked="" type="checkbox"/>

My signature verifies that I have reviewed the proposal and it is ready to go to the next level.

Kouroush Jenab
Originator (Sign and Print)

09/12/2018
Approval Date

Shw Nilesch Joshi
Department Curriculum Committee Chair (Sign and Print)

09/12/18
Approval Date

COURSE

New Course or Major Revision to Existing Course

This outline is to be used when a new course is proposed or when a major change is proposed to an existing course. If you are preparing a *new* experimental course/workshop proposal, please use the New Experimental Course/Workshop form. This outline is not to be used for General Education Courses. Refer to the General Education web site.

I. COURSE INFORMATION

- The course title should only be 30 characters.
- The following are definitions of terms related to courses:
 - **Petition required** – requires permission from the Department Chair to enroll in a section of the course.
 - **Equated** – two different courses with the same content at the same level with different prefixes.
 - **Restricted** – program admission is required and/or must have Department Chair approval.
 - **Formula** – (3-0-3) = instruction hours – lab hours – credit hours

This is a New Course Revised Course

Course Name <small>(as listed in the current catalog)</small>	Course prefix <small>(Example: ENG)</small>	Number <small>(Example: 100)</small>	Title <small>(Example: Writing I)</small>	Formula <small>(Example: 3-0-3)</small>	Faculty Load <small>(Contact your Department Chair or Dean's Office for assistance)</small>	Intended Terms Offered <small>(Example: Fall/Spring)</small>
	ETM	319	Quality and Reliability Engineering	3-0-3	3.0	Fall/Spring
Proposed Course Name:	Course prefix <small>(Example: ENG)</small>	Number <small>(Example: 100)</small>	Title <small>(Example: Writing I)</small>	Formula <small>(Example: 3-0-3)</small>	Faculty Load <small>(Contact your Department Chair or Dean's Office for assistance)</small>	Intended Terms Offered <small>(Example: Fall/Spring)</small>
	ETM	319	Quality and Reliability Engineering	3-0-3	3.0	Fall/Spring

Approved major or program(s) in which the course will be offered. (as listed in the current catalog)

Engineering Management Area – Bachelor of Science
 Engineering Technology Area – Bachelor of Science
 Technology Management Area – Bachelor of Science
 Industrial Education Area – Bachelor of Science

This is a required course. This is an elective course.

Course Description Course description *exactly as it will appear in the catalog and as it appears on the sample syllabus.* Include pre-requisites/co-requisites, petition requirements, course equations, restrictions and term(s) offered. Example: XYZ 288. Guidelines for a New Course. (3-0-3) Fall and Spring; petition required. A study of the impact of technology on individuals, society, and the environment. Equated with ABC 288.

ETM 319 Quality and Reliability Engineering. (3-0-3); I, II. Designed to provide analytical and statistical inference techniques for process and product control. Students will learn how to perform quality control using mathematical tools with a focus on statistical methods. Two major areas of statistical quality control, on which students will extensively work on are reliability engineering and statistical process control (SPC) using control charts. Furthermore, students will understand the mission of a quality improvement system as part of quality and reliability engineering.

Prerequisite: MATH 175 OR MATH 275 OR MATH 353 OR MATH 365.

II. PURPOSE, GOALS AND OBJECTIVES

A. What are the goals and objectives of the proposal? Explain why you are proposing a new course or why and how you are revising a current course.

The course description and prerequisites need to be aligned with the course title and requirements. Currently, the course description states the application of analytical and statistical techniques for quality control in manufacturing systems without emphasis on reliability techniques taught in the second half of the semester. Therefore, the new course description should read:

ETM 319 Quality and Reliability Engineering. (3-0-3); I, II. Designed to provide analytical and statistical inference techniques for process and product control. Students will learn how to perform quality control using mathematical tools with a focus on statistical methods. Two major areas of statistical quality control, on which students will extensively work on are reliability engineering and statistical process control (SPC) using control charts. Furthermore, students will understand the mission of a quality improvement system as part of quality and reliability engineering.

Prerequisite: MATH 175 OR MATH 275 OR MATH 353 OR MATH 365.

B. Justify the proposed instructional level (100-600) or instructional level change.

This is a 300 level course and no change is required.

C. List the student learning outcomes for the course.

- 1- Demonstrate general understanding of quality improvement using statistical process control (SPC).
- 2- Apply the tools of statistical process control (SPC): Pareto diagram, check sheet, process flow diagram, and scatter diagram.
- 3- Develop control charts for variables and process capability.
- 4- Develop different types of control charts for attributes.
- 5- Understand the concept of probability.
- 6- Understand fundamentals of statistics and calculate and interpret: measures of central tendency, measures of dispersion, and the normal distribution curve.
- 7- Design acceptance sampling plans and determine the criteria for accepted/rejected lots.
- 8- Calculate and apply various techniques for reliability engineering plans and product failure curves.
- 9- Analyze life data.
- 10- Assess design techniques for reliability.
- 11- Analyze reliability testing & data.
- 12- Reliability growth.

D. Describe how those student learning outcomes will be assessed. List each activity and the assessment method for that activity. For example: 1. Students will write a term paper; scored by a rubric; **or** 2. Students will complete an exam; objective test.

- 1- Demonstrate general understanding of quality improvement using statistical process control (SPC). (Assessed in Discussion Boards 1-3 scored by rubric, and Assignments 1-4, objective test).
- 2- Apply the tools of statistical process control (SPC): Pareto diagram, check sheet, process flow diagram, and scatter diagram. (Assignment 2, objective test).
- 3- Develop control charts for variables and process capability (Assessed in Discussion Board 2, scored by rubric, Assignment 2 & 3, objective test).
- 4- Develop different types of control charts for attributes (Assessed in Discussion Board 3, scored by rubric, Assignment 4, objective test).
- 5- Understand the concept of probability. (Assignment 5, objective test).
- 6- Understand fundamentals of statistics and calculate and interpret: measures of central tendency, measures of dispersion, and the normal distribution curve. (Assignment 5, objective test).
- 7- Design acceptance sampling plans and determine the criteria for accepted/rejected lots. (Assessed in Discussion Board 4, scored by rubric, objective test).
- 8- Calculate and apply various techniques for reliability engineering plans and product failure curves. (Assessed in Discussion Board 3, scored by rubric, Assignment 3 and Final Exam, objective test).
- 9- Analyze life data (Assessed in Discussion Board 5, scored by rubric, and Assignment 6 &7, objective test).
- 10- Assess design techniques for reliability (Assessed in Assignment 8, objective test).
- 11- Analyze reliability testing & data (Assessed in Assignment 9, objective test).
- 12- Reliability growth (Assessed in Assignment 10, objective test).

Note: all learning outcomes will be assessed via objective tests (Exam I, Exam II, and Final Exam).

E. Define how the course helps students to achieve learning objectives required for the program.

All courses of Department of Engineering and Technology Management will prepare students for highly specialized technology careers, or to continue their education in graduate school. Customized ETM 319 Quality and Reliability Engineering course, the students acquire analytical and statistical knowledge for process and product control and reliability improvement. As a result, students will understand the mission of a quality improvement system and system reliability analysis that will improve their overall skill set.

F. Explain how the specific goals and objectives of the course relate to the mission statement of the University.

This course will enhance the students knowledge for success in a global environment, engage in scholarship, and serve the community by improving all dimensions of quality and reliability.

III. IMPACT

A. List any existing course(s) that will be replaced by the proposed/revised course.

None

B. List other courses now offered at MSU that will have duplication or overlap. Explain the degree to which the course duplicates or overlaps and provide justification for the duplication or overlap.

None

C. List departments and programs that could be impacted by this proposal. For example, any department that:

- a. requires the course
- b. offers the course as an elective
- c. offers a similar course
- d. has an equated course
- e. has the course listed as a co-requisite or pre-requisite
- f. shares staff and/or resources

The Department of Mathematics and Physics will be impacted because of the following course prerequisite: MATH 175 OR MATH 275 OR MATH 353 OR MATH 365.

D. List each of the individuals notified by the proposing department chair and define the method of contact (e-mail, phone conversation, etc.)

Prof. Christopher Schroeder, Chair
 Department of Mathematics & Physics
 c.schroeder@moreheadstate.edu
 Email date: 09/12/2018

IV. PERSONNEL

A. List names, qualifications including the highest earned degree, and academic rank(s), of faculty available to MSU who will teach the course.

Kouroush Jenab, Ph.D. in Mechanical Engineering, Ph.D. in Industrial Engineering, Assistant Professor

B. Identify external adjunct faculty, if appropriate.

N/A

V. ADDITIONAL INFORMATION

A. Desired section size and anticipated enrollment.

Section size: 40 students, Anticipated enrollment: 35 students

B. Desired implementation date for the course.

Fall 2019

C. Method of instruction (online, lecture, laboratory, individualized, etc.).

Lecture/Online/Hybrid

D. Additional facilities and special equipment needs for this course, if any.

None

E. Use of library resources

It is recommended that you contact a library liaison prior to completing this section to determine what resources and services are available to support the course.

- Does the course require library resources to support specific class assignments or supplemental reading? Yes No
- Do the library services and resources presently available meet student needs for the course? Yes No

If not, what library acquisitions are being proposed to meet essential needs?

F. Does this course require new technology?

Please note that Information Technology (GH 110) should be notified when the course proposal is being developed. Early notification will allow IT an opportunity to provide quality information that can be included in the proposal request form.

- Yes (If yes, you must have a representative from Information Technology review the proposal and sign the signature sheet.)
- No

If yes, please list:

1. the software to be used and its estimated cost. If there is intent to utilize the software in a lab, include the estimated cost of the server-based license for the software. (IT does not install individual packages in labs, only server-based versions).
2. the type of hardware to be utilized.

G. Does this course involve the use of live animals? Yes No

If so, include the approval form from the associated Institutional Animal Care and Use Committee (IACUC).

H. Please include a sample syllabus (must start on new page). *All elements on the syllabus checklist must be included on the sample syllabus* (syllabus checklist attached).

- Proposals for all Teacher Education courses (including content courses that typically have 50% more teacher preparation majors enrolled) are required to go to the Teacher Education Committee as part of the curriculum approval process
- The teacher education syllabi must contain these elements: the theme for MSU's Teacher Education Program; CAEP* themes; any additional EPSB themes; and program appropriate Kentucky Teacher Standards (www.kyepsb.net/teacherprep/standards.asp). Further information and models are provided at <http://www.moreheadstate.edu/education/>.
- *The College of Education (CoE) is NCATE accredited. NCATE and TEAC have combined to form CAEP, a new national accrediting organization. Educator Preparation Programs, including the CoE at MSU are in the process of transitioning from NCATE to CAEP and as such, we are working to transition to align our programs with CAEP standards and requirements in anticipation of our next accreditation visit in 2018, at which time we will fall fully under CAEP standards and guidelines. For more information on CAEP and the new accreditation process, please see www.caepnet.org.

ETM 319
Quality and Reliability Engineering Course
Syllabus
Fall 2019

Department of Engineering and Technology Management School of
Engineering and Information Systems Morehead State University

Course Description

ETM 319 Quality and Reliability Engineering. (3-0-3); I, II. Designed to provide analytical and statistical inference techniques for process and product control. Students will learn how to perform quality control using mathematical tools with a focus on statistical methods. Two major areas of statistical quality control, on which students will extensively work on are reliability engineering and statistical process control (SPC) using control charts. Furthermore, students will understand the mission of a quality improvement system as part of quality and reliability engineering.

Prerequisite: MATH 175 OR MATH 275 OR MATH 353 OR MATH 365.

Instructor

Dr. Kouroush Jenab, P.Eng
209 Lloyd Cassity Building Morehead State
University Tel: (606)-783-9339
E-mail: k.jenab@moreheadstate.edu

Class Time: Online

Note: The online section is for Technology Management students only, unless with valid approval from advisor/instructor.

Office Hours: Wed. 11:00AM-12:00Noon, 03:00PM-05:00PM, Thu. 03:00PM-04:00PM & Fri. 10.00AM-12:00Noon

Required Textbook

Renyan Jiang (2015). Introduction to Quality and Reliability Engineering, Springer, ISBN: 978-662-47214-9.

Supplementary Textbook

Dhillon B.S. (2007). Applied Reliability and Quality: Fundamental, methods, and applications. Springer, ISBN: 978-1-84628-497-7.

Besterfield, D. H. (2013). Quality Improvement (9th Ed.), Pearson, ISBN: 9780132624411.

Course Objectives

- 1- Demonstrate general understanding of quality improvement using statistical process control (SPC).
(Assessed in Discussion Boards 1-3 scored by rubric, and Assignments 1-4, objective test).
- 2- Apply the tools of statistical process control (SPC): Pareto diagram, check sheet, process flow diagram, and scatter diagram. **(Assignment 2, objective test).**
- 3- Develop control charts for variables and process capability **(Assessed in Discussion Board 2, scored by rubric, Assignment 2 & 3, objective test).**
- 4- Develop different types of control charts for attributes **(Assessed in Discussion Board 3, scored by**

- rubric, Assignment 4, objective test).**
- 5- Understand the concept of probability. **(Assignment 5, objective test).**
 - 6- Understand fundamentals of statistics and calculate and interpret: measures of central tendency, measures of dispersion, and the normal distribution curve. **(Assignment 5, objective test).**
 - 7- Design acceptance sampling plans and determine the criteria for accepted/rejected lots. **(Assessed in Discussion Board 4, scored by rubric, objective test).**
 - 8- Calculate and apply various techniques for reliability engineering plans and product failure curves. **(Assessed in Discussion Board 3, scored by rubric, Assignment 3 and Final Exam, objective test).**
 - 9- Analyze life data **(Assessed in Discussion Board 5, scored by rubric, and Assignment 6 &7, objective test).**
 - 10- Assess design techniques for reliability **(Assessed in Assignment 8, objective test).**
 - 11- Analyze reliability testing & data **(Assessed in Assignment 9, objective test).**
 - 12- Reliability growth **(Assessed in Assignment 10, objective test).**
- Note:** all learning outcomes will be assessed via objective tests (Exam I, Exam II, and Final Exam).

Course Requirements

1. **Attendance:** In order to earn the points assigned for class participation, students must be present in all sessions of the class and must be actively involved in ALL activities including the online DISCUSSION BOARD and GROUP PROJECTS.
2. **Student Information Blog Page:** Students are to complete their information blog page in Black board. Instructions for this assignment will be posted during the first week. The due date for this assignment will be announced by the instructor.
3. **Discussion Board:** Students are required to participate constructively in all discussion board activities in order to earn the points assigned for discussion board activities. At the beginning of each week, the instructor will inform students of the due dates for discussion board. No posts to the discussion board will be accepted after the announced due date.
4. **Assignments:** Each student will be required to submit weekly individual projects/assignments that will be assigned and posted by the instructor. Each individual project/assignment must be submitted on the specified due date. Projects/assignments submitted after the due date will be reduced one letter grade for each week past the due date. Should a student need to miss an assignment, the instructor must be consulted beforehand. MSU's excused absences fall into five categories: 1) University sponsored activities; 2) Student/Family illness/death; 3) Military obligations; 4) Jury duty or subpoena for court appearances, or 5) Major religious holidays.
5. **Exams:** **There will be two (2) exams during the semester and a FINAL EXAM. There will be no makeup exams. There is no substitute for any exams. Should a student need to miss an exam, the instructor must be consulted beforehand. Otherwise, it is not accepted and the student will not receive any credit for that exam.** MSU's excused absences fall into five categories: 1) University sponsored activities; 2) Student/family illness/death; 3) Military obligations; 4) Jury duty or subpoena for court appearances, and 5) Major religious holidays. The scores/grade earned in each exam in the course including the Final Exam, form a significant part of the student's overall grade. To that end, students are encouraged to utilize all the study resources available for the course to prepare adequately for each exam.

Evaluation:

Activity	Points
Attendance and Participation	50
Personal Information Blog	20
Discussions Board (5)	50
Assignments (10)	300

Exam 1	150
Exam 2	150
Final Exam	280
TOTAL	1000

Note: 90 – 100% = A; 80 – 89% = B, 70 – 79% = C, 60 – 69% = D, Below 60% = E

ACADEMIC HONESTY: Cheating, fabrication, plagiarism or helping others to commit these acts will not be tolerated. Academic dishonesty will result in severe disciplinary action including, but not limited to, failure of the student assessment item or course, and/or dismissal from MSU. If you are not sure what constitutes academic dishonesty, read The Eagle: Student Handbook or ask your instructor. The policy is located at <http://www.morehead-st.edu/units/studentlife/handbook/academicdishonesty.html>.

For example: Copying information from the Internet is plagiarism if appropriate credit is not given.

Americans with Disabilities Act (ADA): Students with disabilities are entitled to academic accommodations and services to support their access and safety. The Office for Disability Services in 202 ADUC coordinates reasonable accommodations for students with documented disabilities. Although a request may be made at any time, services are best applied when they are requested at or before the start of the semester. Please contact Disability Services at 606-783-5188 or e.day@moreheadstate.edu or visit their website at www.moreheadstate.edu/disability for more information.

CAMPUS SAFETY STATEMENT: Emergency response information will be discussed in class. Students should familiarize themselves with the nearest exit routes in the event evacuation becomes necessary. You should notify your instructor at the beginning of the semester if you have special needs or will require assistance during an emergency evacuation. Students should familiarize themselves with emergency response protocols at www.moreheadstate.edu/emergency.

CONTINGENCY PLAN: In case of emergency that may impact classes, students are expected to contact Blackboard for an announcement by the instructor.

Course Outline (Subject to change):

Lecture	Topic	Assignment / Exam
1	INTRODUCTION: Syllabus and Introduction to Quality and Reliability Engineering	Student Blog Page
2	SECTION 1: Fund. of Statistics (Course Note)	DB 1 Individual Assignment 1
3	SECTION 2: Statistical Process Control (SPC Part 1_Control Charts for Variables (CH, 12 & 14 + Course Note)	Individual Assignment 2
4	SECTION 3: Statistical Process Control (SPC Part 2_Control Charts for Variables (Contd.) (CH, 12 & 14 + Course Note)	DB 2
5	SECTION 4: Statistical Process Control (SPC Part 3_Process Capability (CH, 12 & 14 + Course Note)	Individual Assignment 3
6	SECTION 5: Statistical Process Control (SPC Part 4_Control Charts for Attributes (CH, 12 & 14 + Course Note)	DB 3 Individual Assignment 4

		EXAM 1
7	SECTION 6: Acceptance Sampling (CH 13 + Course Note)	DB 4
8	SECTION 7: Probability & Distribution Models (CH 4 + Course Note)	Individual Assignment 5
	BREAK	
9	SECTION 8: Fundamentals of Reliability (CH 3 + Course Note)	Individual Assignment 6
10	SECTION 9: Life Data Analysis (CH 5 + Course Note)	DB 5 Individual Assignment 7
11	SECTION 10: Design Techniques for Reliability (CH 9 + Course Note)	Individual Assignment 8
		EXAM 2
12	SECTION 11: Reliability Testing & Data Analysis (CH 10 + Course Note)	Individual Assignment 9
13	SECTION 12: Reliability Growth (CH 11 + Course Note)	Individual Assignment 10
		Final Exam

NOTE: This syllabus is subject to change at the discretion of the instructor to accommodate student and/or instructional needs. Changes will be announced through Blackboard.

NOTE: No cell phone allowed in the class.



COURSE
Minor Revision to an Existing Course
Undergraduate Curriculum Routing Form
 Revised September 2016

Course:	SSE 444 - Satellite Communications
Department:	Earth and Space Sciences
College	Science

Signatures

ERIC JERDE	<i>Eric Jerde</i>		10/10/18
Originator (Print and Sign)			Date
Thomas Pannuti	<i>Thomas Pannuti</i>	<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	10/15/18
Departmental Curriculum Committee Approval (Print and Sign)			Date
ERIC JERDE	<i>Eric Jerde</i>	<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Disapproved	10/15/18
Department Chair's Approval (Print and Sign)			Date
DIRK G RUPE	<i>Dirk G Rupe</i>	<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Disapproved	2018-Oct-23
College Curriculum Committee Approval (Print and Sign)			Date
Wayne Miller	<i>Wayne Miller</i>	<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Disapproved	10/23/2018
Dean's Approval (Print and Sign)			Date
N/A		<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	
Teacher Ed. Council Approval (if appropriate) (Print and Sign)			Date
Laurie Couch	<i>Laurie Couch</i>	<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Disapproved	11/07/18
Undergraduate Curriculum Committee Action (Print and Sign)			Date
Blair	<i>Blair</i>	<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Disapproved	11-9-18
Vice President for Academic Affairs (Print and Sign)			Date

<i>For Academic Programs Office Use Only</i>	
Date proposal received in Academic Programs Office: _____	
Date Academic Programs notified SAC's Liaison: _____	
Deleted Program Suspension Date: _____	Final Program Deletion Date: _____
SACS Response: <input type="checkbox"/> Approved <input type="checkbox"/> Denied <input type="checkbox"/> Revision Required	SAC's Response Date: _____
Date Academic Programs notified of SAC's Response: _____	CPE Notification Date: _____

COURSE
Minor Revision to an Existing Course

*Revised-
See Attached*

I. COURSE

This outline is to be used to report a minor modification (e.g., title, prefix, course number, catalog course description, minor admission or completion requirements, equate a current course with a new course) of previously approved courses. *Minor changes do not modify course content.* If the course content or formula is to be modified, use the New Course or Major Revision to Existing Course Form. Terms offered should be consistent with the curriculum map.

Current Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
	SSE	444	Satellite Communications	2-2-3	Spring
Proposed Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
	SSE	444	Satellite Communications	2-2-3	Spring

List departments and programs that could be impacted by this proposal.

School of Engineering and Information Systems, College of Business & Technology

List the individuals notified by the proposing department chair and define the method of contact (e-mail, phone conversation, etc.)

Since this class is used by programs in the School of Engineering and Technology Management, Dr. Ahmad Zargari, Associate Dean of the School, was contacted my email and in person about the change. *See revised copy*

II. JUSTIFICATION:

Supply justification for the change and describe briefly what this proposal is requesting. (What are you doing and why are you doing it?)

The applicable material formerly provided by EEC 344 is covered in PHYS 211 and SSE 442. Therefore EEC 344 is being removed as a prerequisite and SSE 442 added as the new pre-requisite. *See revised copy*

III. ADDITIONAL INFORMATION

If this is a change that affects the current MSU Undergraduate Catalog content, please provide the verbiage as you would like for it to appear in the MSU Undergraduate catalog.

There are no changes to the course description or Corequisites. The prerequisites should be revised as follows:
 SSE 442 must be completed prior to taking this course.
 SSE 444L must be taken at the same time as this course.

COURSE

Minor Revision to an Existing Course

I. COURSE

This outline is to be used to report a minor modification (e.g., title, prefix, course number, catalog course description, minor admission or completion requirements, equate a current course with a new course) of previously approved courses. *Minor changes do not modify course content.* If the course content or formula is to be modified, use the New Course or Major Revision to Existing Course Form. Terms offered should be consistent with the curriculum map.

Current Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
		SSE	444	Satellite Communications	2-2-3
Proposed Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
		SSE	444	Satellite Communications	2-2-3

List departments and programs that could be impacted by this proposal.

School of Engineering and Information Systems, College of Business & Technology

List the individuals notified by the proposing department chair and define the method of contact (e-mail, phone conversation, etc.)

Since this class is used by programs in the School of Engineering and Technology Management, Dr. Ahmad Zargari, Associate Dean of the School was contacted my email and in person about the change. The equivalent change to the equated course (EEC 444) is also being made by the School of Engineering and Technology Management.

II. JUSTIFICATION:

Supply justification for the change and describe briefly what this proposal is requesting. (What are you doing and why are you doing it?)

The applicable material formerly provided by EEC 344 is covered in PHYS 211 and SSE 442. Therefore SSE 442 is being added as a new acceptable pre-requisite.

III. ADDITIONAL INFORMATION

If this is a change that affects the current MSU Undergraduate Catalog content, please provide the verbiage as you would like for it to appear in the MSU Undergraduate catalog.

There are no changes to the course description or Corequisites. The prerequisites should be revised as follows:
 SSE*442 or EEC 344 - Must be completed prior to taking this course.
 SSE*444L - Must be taken at the same time as this course.

Sharri Lynn Jones

From: Thomas Gregory Pannuti
Sent: Monday, November 5, 2018 1:38 PM
To: Sharri Lynn Jones
Cc: Eric Jerde
Subject: Adding EEC 344 as an acceptable pre-requisite for SSE 444

Follow Up Flag: Follow up
Flag Status: Flagged

Hello Sharri -- Just a quick note (on behalf of the Undergraduate Curriculum Committee for the Department of Earth and Space Sciences) to say that we would like to add the course EEC 344 as an acceptable pre-requisite to our revised proposal regarding the course SSE 444. I wish to bring this to your attention in advance of the November 28th meeting of the University Committee. Please let me know if you have any questions about this proposal -- thank you! -- Tom

Thomas Pannuti, PhD
Professor of Space Science and Astrophysics
Department of Earth and Space Sciences
Space Science Center, Room 212E
235 Martindale Drive
Morehead State University
Morehead, KY 40351

Sharri Lynn Jones

From: Wayne Creger Miller
Sent: Tuesday, November 6, 2018 2:32 PM
To: Laurie L. Couch
Cc: Sharri Lynn Jones
Subject: FW: SSE 444
Attachments: SSE 444 - Pre-req change rev2.docx

I agree with the proposed changes to the pre-requisite courses and equated courses as outlined in the proposal.

Wayne

Wayne C. Miller, Ph.D.

Dean
College of Science
Morehead State University
246 Reed Hall
Morehead, KY 40351
Phone: 606-783-2023
Fax: 606-783-5039



From: Eric Jerde
Sent: Tuesday, November 6, 2018 1:40 PM
To: Wayne Creger Miller <w.miller@moreheadstate.edu>
Subject: SSE 444

Dr. Miller,

I spoke with AZ, and although he was not willing to delete EEC 444, we did agree to list both EEC 344 and SSE 442 as acceptable pre-reqs for both of the equated courses. Laurie and Sharri have indicated that if they hear from the various parties by email that these are acceptable, that it should be OK for the curriculum meeting tomorrow. Dirk polled his committee and they agreed, and Tom has sent a message to Laurie. Could you do the same? I have attached a copy of the SSE 444 proposal. AZ has not yet sent anything, and he is now on his way to a conference till next Monday. I think I will have to contact Greg about this if AZ does not respond.

Thanks!

Eric

Sharri Lynn Jones

From: Dirk Grupe
Sent: Tuesday, November 6, 2018 10:24 AM
To: Sharri Lynn Jones
Cc: Eric Jerde
Subject: SSE 444

Hi Sharri

.k., I just got the final vote from my committee on the SSE 444 proposal with the new pre-req changes. They are all o.k. with it. So from our side it's good to go for tomorrow.

All the best

Dirk

Dr. Dirk_Grupe
Space Science Center
Morehead State University
235 Martindale Dr.
Morehead, KY 40351, USA
d.grupe@moreheadstate.edu

Sharri Lynn Jones

From: Christopher Schroeder
Sent: Monday, November 5, 2018 1:14 PM
To: Laurie L. Couch
Cc: Sharri Lynn Jones
Subject: PHYS 211 and SSE Program Proposal

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Laurie,

Dr. Jerde asked me to write you to let you know that we are fully aware of the PHYS 211 requirement as outlined in the new SSE program proposal and have agreed to teach the course as often as is necessary to keep up with demand for students in his program. In addition, we have agreed to work with faculty members in his department to let them teach the class on occasion to help ensure that the course will be offered sufficiently many times.

Please let me know if you have any questions, or if I can be of any further assistance.

Best,
Chris

Christopher Schroeder
Chair, Department of Mathematics and Physics
105A Lappin Hall
Morehead State University
606-783-2938
www.moreheadstate.edu/maph



COURSE
Minor Revision to an Existing Course
Undergraduate Curriculum Routing Form
 Revised September 2016

Course:	SSE 444 - Satellite Communications
Department:	Earth and Space Sciences
College	Science

Signatures

ERIC JERDE <i>Eric Jerde</i>		11/5/2018
Originator (Print and Sign)		Date
<i>Thomas Pennuti</i> TOM PENNUTI	<input checked="" type="checkbox"/> Approved () Disapproved	11/5/2018
Departmental Curriculum Committee Approval (Print and Sign)		Date
<i>Eric Jerde</i> ERIC JERDE	<input checked="" type="checkbox"/> Approved () Disapproved	11/7/2018
Department Chair's Approval (Print and Sign)		Date
<i>[Signature]</i> DIRK GRUPE	<input checked="" type="checkbox"/> Approved () Disapproved	2018-NOV-08
College Curriculum Committee Approval (Print and Sign)		Date
<i>Wayne Miccer</i> WAYNE MICCER	<input checked="" type="checkbox"/> Approved () Disapproved	11/8/2018
Dean's Approval (Print and Sign)		Date
	() Approved () Disapproved	
Teacher Ed. Council Approval (if appropriate) (Print and Sign)		Date
	() Approved () Disapproved	
Undergraduate Curriculum Committee Action (Print and Sign)		Date
	() Approved () Disapproved	
Vice President for Academic Affairs (Print and Sign)		Date

For Academic Programs Office Use Only

Date proposal received in Academic Programs Office: _____

Date Academic Programs notified SAC's Liaison: _____

Deleted Program Suspension Date: _____ Final Program Deletion Date: _____

SACS Response: Approved Denied Revision Required SAC's Response Date: _____

Date Academic Programs notified of SAC's Response: _____ CPE Notification Date: _____

COURSE
Minor Revision to an Existing Course

I. COURSE

This outline is to be used to report a minor modification (e.g., title, prefix, course number, catalog course description, minor admission or completion requirements, equate a current course with a new course) of previously approved courses. *Minor changes do not modify course content.* If the course content or formula is to be modified, use the New Course or Major Revision to Existing Course Form. Terms offered should be consistent with the curriculum map.

Current Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
	SSE	444	Satellite Communications	2-2-3	Spring
Proposed Course Name:	Course prefix (Example: ENG)	Number (Example: 100)	Title (Example: Writing I)	Formula (Example: 3-0-3)	Intended Terms Offered (Example: Fall/Spring)
	SSE	444	Satellite Communications	2-2-3	Spring

List departments and programs that could be impacted by this proposal.

School of Engineering and Information Systems, College of Business & Technology

List the individuals notified by the proposing department chair and define the method of contact (e-mail, phone conversation, etc.)

Since this class is used by programs in the School of Engineering and Technology Management, Dr. Ahmad Zargari, Associate Dean of the School was contacted my email and in person about the change. The equivalent change to the equated course (EEC 444) is also being made by the School of Engineering and Technology Management.

II. JUSTIFICATION:

Supply justification for the change and describe briefly what this proposal is requesting. (What are you doing and why are you doing it?)

The applicable material formerly provided by EEC 344 is covered in PHYS 211 and SSE 442. Therefore SSE 442 is being added as a new acceptable pre-requisite.

III. ADDITIONAL INFORMATION

If this is a change that affects the current MSU Undergraduate Catalog content, please provide the verbiage as you would like for it to appear in the MSU Undergraduate catalog.

There are no changes to the course description or Corequisites. The prerequisites should be revised as follows:
 SSE*442 or EEC 344 - Must be completed prior to taking this course.
 SSE*444L - Must be taken at the same time as this course.



PROGRAM
New Program - Full Proposal
 Revised July 2017

For Office Use Only:
 Date of CPE Approval: _____
 Date of Implementation: _____

New Program Title: Space Systems Engineering
 New Program Department: Earth and Space Sciences
 New Program College: Science
 New Program Director: Eric Jerde, Chair

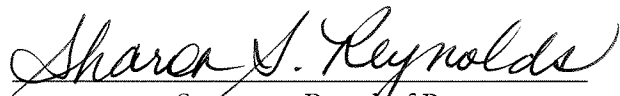
Signatures

Eric Jerde Originator (Print and Sign)		<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	10/10/18 Date
Departmental Curriculum Committee Approval (Print and Sign)	Thomas Pannuti 	<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	10/15/18 Date
Department Chair's Approval (Print and Sign)	ERIC JERDE 	<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	10/15/18 Date
College Curriculum Committee Approval (Print and Sign)	 DIRK GRUPE	<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	2018-Oct-23 Date
College Dean's Approval (Print and Sign)	 WAYNE MILLER	<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	10/23/2018 Date
Information Technology Resources are Available (Print and Sign)	N/A	<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	
Teacher Ed. Council Approval (if appropriate) (Print and Sign)	N/A	<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	
Dean of Graduate School (if appropriate) (Print and Sign)	Laurie Couch 	<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Disapproved	11/07/2018 Date
Undergraduate Curriculum Committee (Print and Sign)		<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Disapproved	11-9-18 Date
Vice President for Academic Affairs (Print and Sign)		<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Disapproved	11-26-18 Date
President (Print and Sign)		<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	
Board of Regents (Print and Sign)		<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	

CERTIFICATION

The undersigned, Secretary of the Board of Regents of Morehead State University, Morehead, Kentucky, hereby certifies that the foregoing is a true copy of an action adopted by the Board of Regents of said University at a meeting held on December 6, 2018, as recorded in the official Minute Book of said Board of Regents, which is in my custody and under my control, that said meeting was held in accordance with all applicable requirements of Kentucky law, including KRS 61.810, 61.815, 61.820, and 61.823, that a quorum was present at said meeting, and that the aforesaid action is of record in the office of the Board, has not been modified, amended, or rescinded, and is in full force and effect at this date.

WITNESS my signature this 6th day of December, 2018.

A handwritten signature in cursive script that reads "Shara S. Reynolds". The signature is written in black ink and is positioned above a horizontal line.

Secretary, Board of Regents
Morehead State University

**BACHELOR OF SCIENCE
SPACE SYSTEMS ENGINEERING**

**BOR (IV-B-2)
December 6, 2018**

Recommendation:

That the Board of Regents approve the Bachelor of Science in Space Systems Engineering proposal by the MSU Department of Earth and Space Science.

Background:

The proposed Bachelor of Science in Space Systems Engineering is a slight restructuring of the current Bachelor of Science – Space Science Area program. The modifications include two new courses replacing electives, three new program courses, and a change in the CIP code to 14.0201, which is reserved for engineering programs. These changes are designed to position the program as a nationally distinctive bachelor's degree in Space Systems Engineering to support the U.S. aerospace and electronics industries as well as the needs of government, national defense, and homeland security. The program is specifically designed to be an innovative program focusing on applied nanosatellite technologies.

The proposed program has been approved through university curriculum review processes and is currently posted statewide through the Council on Postsecondary Education's pre-proposal review platform for public comment until December 15, 2018.

The full proposal should be submitted at least one month prior to the Council Postsecondary Education meeting at which it will be heard.

If approved, new programs will be placed on provisional status and will be subject to an initial review process as outlined in the Review of Existing Academic Programs Policy. Institutions must implement the new program within five years of the Council Postsecondary Education approval.

Title of proposed degree program: Space Systems Engineering

Degree Designation: Bachelor of Science Engineering
As on Diploma (e.g.: Bachelor of Arts Interior Design, Bachelor of Science Forestry, Bachelor of Science in Pharmacy)

Please complete BOTH sections:

CIP Code (2-Digit) (Number and Name): Example: 03-Natural Resources and Conservation

(CIP code information is on the Integrated Postsecondary Education Data System site: <https://nces.ed.gov/ipeds/cipcode/browse.aspx?y=55>)

14 - Engineering

CIP Code (Number and Name): Example: 03.0508-Urban Forestry

14.0201 – Aerospace, Aeronautical, and Astronautical/Space Engineering

Intended Implementation Date (semester and year): Fall 2019

Anticipated Date for Granting First Degree (semester and year): Fall 2020

Institutional Contact Information:

First Name: Laurie Last Name: Couch Title: Associate VP Undergraduate Education and Student Success
Email: l.couch@moreheadstate.edu Work Phone: 606-783-2484

Mission

A program will adhere to the role and scope of the institution as set forth in its mission statement and as complemented by the institution's strategic plan.

1. List the objectives of the proposed program. These objectives should deal with the specific institutional and societal needs that this program will address.

For the last 10-15 years, the mission of the Space Science Program is to provide students with an innovative educational experience through which they can gain employment in the broad area of aerospace and bring experience, leadership, and innovation to enhance the economic development of the Commonwealth and the nation. Toward this goal, students are immersed in project-based learning, where they learn to develop instrumentation and processes designed to explore, investigate, and gain insight into the physics of the universe. This involves developing and testing space systems technologies and space mission operational procedures for practical and commercial applications, with the goal of producing highly skilled scientists and engineers to support these critically important areas. During this time, the Space Science program has evolved, and morphed into what we feel is a true engineering degree. One of our recent graduates was hired by a division of the U.S. Air Force and based on their evaluation of the work she did, hired her as an electrical engineer. The "new" program proposed herein is essentially the same one currently in place, with a couple of modifications (two new courses replacing electives) to align with accreditation

guidelines. Our principal aim with this proposal is to change the CIP code to CIP 14.0201, with a change in the program name to Space Systems Engineering.

We propose a nationally distinctive bachelor's degree in Space Systems Engineering (BSSSE) at Morehead State University to support the U.S. aerospace and electronics industries as well as the needs of government, national defense, and homeland security. Specifically, we propose to create and implement an innovative degree program in Space Systems Engineering focusing on applied nanosatellite technologies.

Specific Program Objectives:

The BSSSE will provide students with knowledge, skills, and experiences in scientific and engineering disciplines associated with astronautical engineering. The BSSSE broad objective is to produce graduates who will:

- effectively contribute to the workforce in the areas of astronautical engineering, electronics, and telecommunications as practicing engineers
- effectively matriculate to graduate programs in astronautical, electrical, and telecommunications engineering

2. Explain how the proposed program relates to the institutional mission and strategic plan.

Morehead State's mission includes

- Educating for a global environment
- Promoting Scholarship
- Foster innovation and collaboration

All of these things are central to what the program already does. Much of the knowledge/skills that a student obtains is applicable in a global sense. Scholarship (defined as dissemination of results of research) is at the core of what is done, with daily meetings, both internal and national in scope, to discuss design readiness, safety, or other aspects of spacecraft design and fabrication. Since every spacecraft and communication protocol is unique, innovation is critical to make systems work. And, since there is much complexity in the design, communication with an orbiting satellite is global in scope, and we rely on other organizations (i.e., NASA, SpaceX, etc.) for the ride into orbit, collaborations are essential to make each project work.

3. Explain how the proposed program addresses the state's postsecondary education strategic agenda.

Much of Morehead State's Strategic Plan includes the focus areas of the statewide plan, namely

- Student Success
- Outcomes-based
- Academic Excellence
- Reputation (as it pertains to recruiting)

The Space Systems program already has a near-100% placement of graduates in the discipline, or into graduate schools. We have a significant number of female students (30%), which is high for STEM fields. Our program features high-impact learning strategies that are project-based and hands-on, which facilitates learning and retention of knowledge and fosters a sense of ownership among the students. All of the work is innovative and high quality, as shown by the number of students taken for internships at high-profile locations such as MIT, Goddard Space Flight Center, the Jet Propulsion Laboratory, Rajant Corporation, and others. Many of these internships have led directly to employment. The efforts to make the program high quality have led to its being selected as the "Best Aerospace R&D in Kentucky" and the "Best College for Aerospace Worker Training in Kentucky" by the Southern Business & Development Magazine (Winter 2018).

4. Explain how the proposed program furthers the statewide implementation plan.

The Space Systems Engineering degree will further the statewide implementation plan in the areas of:

- Success
- Impact

In Success, the academic quality and excellence of the Space Science program (as measured by campus-specific metrics) will be continued as it transitions to the Space Systems Engineering program.

For Impact, the Space Systems Engineering program has four contributions. First, it will increase the number of STEM+H degrees in terms of Engineering. Second, there are over 600 aerospace engineering companies in Kentucky, so there are many opportunities for graduates to stay in the Commonwealth for employment. Thirdly, a large number of our students (12-15 per year) work in internships at major engineering centers such as NASA Goddard, the Massachusetts Institute of Technology, the Jet Propulsion Laboratory, Rajant Corporation, and others. Lastly, there is large extramural funding for the research and development activities in which the students will be involved. Currently, the Space Science Center is working on the Lunar IceCube spacecraft development, a \$10 million project funded by NASA. This spacecraft is being designed, fabricated, and tested at Morehead State University. It will then be tracked by the 21-meter antenna at the university.

Quality

The curriculum should be structured to meet the stated objectives and student learning outcomes of the program.

1. List all student learning outcomes of the program.

1. Develop basic competencies in system engineering and gain familiarity with the concepts and technologies associated with aerospace systems requirements, particularly spacecraft and related subsystems.
2. Learn how to use basic laboratory instrumentation and acquire skills that permit a rapid start in practical "real world" applications in the workplace.
3. Understand issues common to all radio frequency based communications systems, specify relevant system components, participate in design trade studies, perform field/laboratory work at the engineering technologist level, prepare technical reports including studies and analyses and have sufficient preparation to be able to quickly assimilate new technical information.
4. Be prepared to enter the workforce as an entry-level systems engineer or engineering technologist with the ability to integrate the knowledge gained in coursework with the necessary skills of self-direction and research/project implementation.
5. Have an understanding of semiconductor physics, atomic bonding, and crystal structures and imperfections that ultimately dictate the physical and mechanical properties of the materials. Students will also be familiar with processes leading to materials failure, such as thermal, radiative, erosive and corrosive degradations, as well as the corresponding protection approaches as related to the extreme conditions of the space environment.
6. Become familiar with a variety of government and commercial professional opportunities in addition to those in the space industry. These include opportunities in commercial satellite services, space commercial transportation services, space tourism, direct-to-home television, GPS telecommunications, electronics, technical marketing, electronics instrumentation and defense technologies.

2. Explain how the curriculum achieves the program-level student learning outcomes by describing the relationship between the overall curriculum or the major curricular components and the program objectives.

- A narrative explanation may be included in the text box. A table that shows which courses in the program core will meet each of the student learning outcomes is also acceptable. You may attach a Word, Excel, or pdf document to provide the table. *It must be on a separate page within the file.*

Outcome 1: SSE 105, SSE 120, SSE 122, SSE 210, PHYS 211, SSE 320, SSE 340, SSE 360, SSE 442, SSE 444, SSE 445, EEC 400

Outcome 2: SSE 105, SSE 120, SSE 122, PHYS 211, SSE1, SSE 320, SSE 360, SSE 442, SSE 444, SSE 445, EEC 400

Outcome 3: SSE 442, SSE 444, SSE 445, EEC 400

Outcome 4: SSE 360, SSE 498, SSE 499c

Outcome 5: CHEM 111, SSE 320, ETM 307

Outcome 6: SSE 442, SSE 444, SSE 445, SSE 498, SSE 499c

3. Highlight any distinctive qualities of this proposed program.

A Hands-On, Systems Engineering Approach

It is commonplace for students in engineering programs to have some understanding of how a particular device may fit into a system, but at the same time to lack a clear concept of the overall goals of that system. It is considered a key talent to be able to understand the role of the elements in the overall system and to realize the “big picture.” The ability to start with requirements and to design a system to meet specific goals of technical performance, economic constraints, form, and fit is very valuable and relevant to commercial sector needs. The proposed Space Systems Engineering B.S. is based on this philosophy of a systems-level approach to engineering, representing a unique approach to this type of degree program.

Additionally, the rigorous program underway at the Space Science Center in nanosatellite development will provide significant and unique opportunities for graduate students to develop and practice design, manufacturing, and testing and validation process skills on real space systems. The Space Science Center has established a significant portfolio of space missions, both in spacecraft and spacecraft systems development and in ground operations. These include the following completed nano and microsatellites:

1. KySat-1 (with KySpace and University of Kentucky),
2. TechSat-1 (with Radiance Technologies, Honeywell Inc. for the US Space and Missile Defense Command),
3. CXBN (with University of California - Berkeley and small aerospace businesses including AstroDev and Noqsi Aerospace),
4. EduSat (with the European Space Agency and the University of Rome),
5. SMDC II (with Radiance Technologies, Honeywell Inc. for the US Space and Missile Defense Command),
6. UniSat-5 (with the European Space Agency and the University of Rome),
7. KySat-2 (with KySpace and University of Kentucky), and
8. CXBN II,
9. DM7 (with Honeywell, Inc.).

Additionally, several space missions are currently underway including

1. CXBN III,
2. Lunar IceCube (a \$10 million NASA-sponsored mission with Busek Corp. and Goddard Space Flight Center to investigate water resources on the Moon).

Additionally, the Space Science Center has provided ground operations (under contract) to NASA, Johns Hopkins Applied Physics Laboratory, and university and small business partners. The 21-m Tracking Antenna is currently on the process of transitioning to become part of NASA’s Deep Space Network of antennas. It will be unique as the first non-NASA asset used for tracking of spacecraft in the solar system. All of these missions have intimately involved undergraduate students in designing, fabricating, testing, and operating the spacecraft. These missions and future space missions will provide exceptional opportunities for students to perform authentic spacecraft design resulting in senior theses and significant hands-on experiences, making them highly competitive in the job market.

Unique Human Infrastructure

The Space Science Center at Morehead State University has evolved into a center for research in nanosatellite technologies. Talented faculty and staff from Stanford University, the University of California system, the East Coast aerospace industry, and local homegrown Kentucky scientists and engineers have gathered in the hills of Eastern Kentucky to establish a research and development center for small satellite technologies. The Center’s staff, led by Dr. Ben Malphrus, includes Bob Twiggs, the inventor of the CubeSat satellite standard; Jeff Kruth, an electrical engineer with 30+ years in the defense electronics industry; and Kevin Brown, one of the world’s leading nanosatellite engineers. Further, within the academic Department of Earth & Space Sciences are Dr. Tom Pannuti, an expert on supernova remnants and high energy astrophysics, Dr. Dirk Grupe, an expert on supermassive black holes, and who

currently works with the Space Science Center in the fabrication of satellite mock-ups from the computer designs.

Unique Technology-- Nanosatellites

CubeSats are “loaf of bread” or smaller-sized nanosatellites that have become the defacto worldwide standard for small satellite technologies. The basic unit of a CubeSat is 10 cm x 10 cm x 10 cm, and has a mass of under 1 kilogram per unit. Depending on the satellite application, the final satellite may consist of 1, 2, or more units, with the largest single dimension being 30 cm. The recent evolution of micro/nanotechnologies and microelectronics has facilitated the development of inexpensive (\$100,000 to \$1,000,000) highly capable small satellites that are now used by NASA, the U.S. Department of Defense, aerospace companies and universities around the globe. CubeSats, including those developed at Morehead State University, are used for a wide variety of applications ranging from tactical defense satellites to science satellites (including astrophysics research and Earth phenomena and resource monitoring) to practical applications ranging from communications to relaying data from ground sensors. Because of their innovation, cost-effectiveness, and potential for future commercial applications, CubeSats are considered “disruptive technology” by the worldwide aerospace industry — and Morehead State University and Kentucky Space are at the forefront of this emerging technology.

4. Will this program replace or enhance any existing program(s) or track(s) within an existing program?

Yes No If yes, please specify.

The current Bachelor of Science in Space Science will be eliminated and replaced by the proposed program.

This proposal is basically to change the CIP code for our more-than-decade-old Space Science B.S. from 40.0801 (Physics- General) to 14.0201 (Aerospace, Aeronautical and Astronautical/Space Engineering), with a name change to reflect the new CIP code. The primary reasons for this requested change are listed below:

- Since its inception the Space Science B.S. has evolved into more of an engineering program than a physics degree (it is now more specifically astronautical engineering focusing on space systems)
- Our graduates will be more competitive for aerospace engineering careers
- The updated degree (that we would call Space Systems Engineering B.S.) will more directly support workforce development for aerospace engineering that has become integral to Kentucky's economy
- The change would allow us to pursue accreditation through the Accreditation Board for Engineering and Technology (ABET) accreditation as an engineering program, thereby likely increasing our enrollment
- The change would make the undergraduate program consistent with our Space Systems Engineering Master's program (which already carries the CIP 14.0201 designation.)

Currently our graduates are at a disadvantage for employment in the aerospace and defense industries. Many corporate human resources Departments interpret job descriptions as requiring an aerospace engineering degree. While our graduates have been successful in job placement, often it has been a struggle to convince the various human resources departments that the Space Science B.S. is equivalent to an Astronautical Engineering B.S. This transition would facilitate placement of our graduates in the aerospace and defense workforce.

The students currently in the existing Space Science B.S. degree will be provided the option to move into the new Space Systems Engineering B.S. program. The current Space Science B.S. degree will remain, with no new students added, while any current students matriculate through it. Most courses are identical, so there will be no need for adjustments to teaching or special sections of courses to allow for the transition.

5. Include the projected faculty/student in major ratio. Provide an estimate based upon expected enrollment.

We currently have 120 majors in Space Science. This is expected to rise a bit, perhaps to 140 five years from now. All courses in the program are taught by staff attached to the Space Science Center R&D enterprise, so there are no “faculty” per se. If we use the fractional teaching for these staff, we have a full-time equivalent (FTE) of 2.4. So, the FTE/student majors is $2.4/120 = 0.02$, or 50 students per FTE. Of course, a number of the courses required by the program are offered by other departments (e.g., Mathematics and Physics), and their faculty are utilized.

6. Is there a specialized accrediting agency related to this program? Yes No

If yes, identify the agency: Accreditation Board for Engineering and Technology (ABET)

• Do you plan to seek accreditation? Yes No

If yes, explain your plans for accreditation. If no, explain your rationale for not seeking accreditation.

As this program is anticipated to begin in fall 2019, and we have current students in Space Science that can switch over to it, we should have our first graduates in spring 2020. We would begin the self-study portion of the accreditation process in summer 2020, and ABET has a detailed process once the self-study is submitted. It would involve networking with ABET representatives, creating a full application, and site visits, culminating in accreditation in approximately fall 2022.

7. Insert the SACS Faculty Roster Form as a separate page within the file. Files may be in Word, Excel, or pdf format. Faculty resources shall be demonstrated to be adequate and appropriate for the proposed program. The number of faculty should meet external standards where appropriate. The qualifications of faculty will support the objectives and curriculum of the proposed program.

See PDF attachment at the end of the file.

8. Access to the qualitative and quantitative library resources must be appropriate for the proposed program and should meet recognized standards for study at a particular level or in a particular field where such standards are available. Adequacy of electronic access, library facilities, and human resources to service the proposed program in terms of students and faculty will be considered.

A. Describe the library resources available to support this program. You may attach any documentation provided to SACS. Documentation must be submitted as separate pages within the file, and may be in Word, Excel, or pdf format.

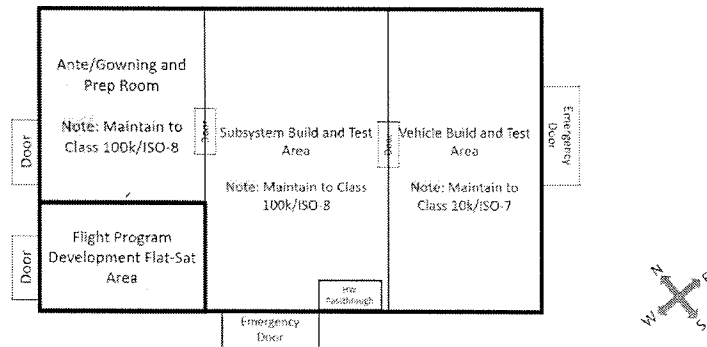
The principal resources are the journal databases that are present, which are sufficient. No additional library resources are anticipated.

B. Describe the physical facilities and instructional equipment available to support this program. Physical facilities and instructional equipment must be adequate to support a high quality program. The proposal must address the availability of classroom, laboratory, and office space as well as any equipment needs.

The current Space Science program is housed in a dedicated building on the Morehead State campus, the Ronald G. Eaglin Space Science Center. In addition to office space for all staff, this building has three principal classrooms (one is a computer lab with 22 workstations) and a 100-seat planetarium (the Star Theater). There are also several labs for doing electronic or other work, a conference room, an anechoic chamber, clean room, and a 21-meter tracking antenna for satellite operations.

The class 1,000/10,000 clean room for NanoSatellite Assembly, Integration and Testing is managed by the Morehead State University Space Science Center. The facility allows fabrication, assembly, and integration of flight-ready systems and components for micro and nanosatellites, and supports fabrication of prototype satellites and payload systems.

The Space Science Center AI&T Cleanroom consists of three of the four bays – the anteroom/prep bay, Subsystem build and Test bay, and Vehicle build and Test bay. The anteroom is used for all gowning and as a staging platform for any final preparation for introducing hardware or tolling into the clean room interior. The clean room interior space 1 and 2 are the area designated for all clean room designated activities, such as hardware assembly, integration, and testing.



Vibration testing verifies satellite survivability post launch and can identify mechanical and structural faults and stresses. The SETL’s vibration slip table allows for 3-axes of testing at or above NASA GEVS levels and can be customized.

Thermal vacuum (T-Vac) testing verifies satellite performance in a simulated space environment with temperature extremes beyond that which the satellite is expected to experience on orbit. The SETL’s T-Vac system has a capacity of 0.29 m³ (10 ft³) and a temperature range of -100°C to +220°C at 1x10⁻⁸ torr. Pass throughs allow for functional testing under vacuum.

Antenna characterization is accomplished using our anechoic chamber and copper screen room facilities that measure antenna parameters such as radiation patterns, gain, system temperature profiles, astronomical radio source gain-to-noise temperature ratio (G/T), cross-polarization isolation contours, and effective isotropically radiated power (EIRP) stability.

The Space Science Center has developed a full motion 21-meter class antenna system that serves as an Earth Station for satellite mission support as well as a test bed for advanced RF systems. The instrument is staffed by university faculty and students and is available for a wide variety of TT&C services. This antenna will become part of NASA’s Deep Space Network of antennas for support of Solar System Exploration in 2019.

Attached are three single-page documents summarizing the facilities at the Space Science Center.

9. Clearly state the admission, retention, and completion standards designed to encourage high quality. Be as detailed as possible and address all three components (admission, retention, and completion).

For about ten years, as the Space Science program evolved into what amounts to an engineering program, we have emphasized three things that encourage high quality: rigor, active (hands-on) learning, and proactive mentoring. While we do not have admission requirements per se, there is a de facto mathematics requirement. To complete the program on time, the first semester of calculus must be taken no later than the second semester of the program, which means that for incoming freshmen, they must be prepared for pre-calculus right from the start, which requires a Math ACT of 24. Every course from Engineering Physics to the major courses in our department is calculus-based, as this is the nature of systems engineering.

All of the work related to the program involve actual projects or pieces of projects that involve students actively working on things directly in addition to reading and studying from written sources. This hands-on approach is time consuming, but the so-called “active learning” is a much better predictor of success. In fact, we have had several students transfer to our Space Science program from others in the state for the very reason that they actually get to lay their hands on and participate in the manufacture of satellites and their various subsystems.

Mentoring of students is another feature of our program. During their time here, students learn about all of the basic subsystems of microsattellites (i.e., payload, power, communications, software operating systems), yet invariably migrate to one that most piques their interest. The staff experts in those areas then become mentors in the students’ final projects and finishing, and help guide them toward graduation.

There are several “group” advising sessions each year to help students navigate the curriculum and to help them stay on track for graduation, answer questions, and assist in building schedules and curriculum plans.

All of these efforts help to guide the students through their time here to help assure their quality and facilitate success.

10. Clearly state the degree completion requirements for the program. Include all completion requirements, including any capstone courses, practicum experiences, etc.

The program requires 81 credits in the core (shown in item #13, below), 37 credits in general education, and 2 credits of electives in the major. There is one capstone course (SSE 499C), which is preceded by a senior design project course (SSE 498), making the full capstone experience being 5 credits.

11. Provide the following information for the program and for each track/concentration (some categories may not apply to all programs). Indicate a zero for any area not requiring hours (e.g., no free electives in the program):

Program Name	Total number of hours required for degree	Number of hours in degree program core	Number of hours in track/concentration	Number of hours in guided electives (any elective required by the major)	Number of hours in free electives (from any academic area not required for major or area)
Space Systems Engineering	120	81	N/A	2	0

12. Describe how the proposed program will articulate with related programs in the state. It should describe the extent to which student transfer has been explored and coordinated with other institutions. Attach all draft articulation agreements related to this proposed program. Files must be separate pages within the file.

We have built a curriculum map that has all of the general education in the first two years. For other specific core courses (SSE 105, SSE 210), appropriate equivalencies have been identified for KCTCS schools. Since there are no other related programs in the state, we have yet to determine an effective articulation for our two basic space systems courses (SSE 120 & SSE 122). This is being addressed at the present time.

**13. List courses under the appropriate curricular headings.
Clicking “TAB” from the last cell will add a new line to the tables in this section.**

Program Core Courses				
Prefix & Number	Course Title	Course Description	Credit Hours	New Y/N
SSE 105	Intro to Electronic Processes	Fundamental electronic calculations, Circuit construction, development of basic skills such as soldering & circuit design.	3	N
SSE 120	Satellites and Space	Intro to Space Systems, orbital mechanics, Space environment, satellite applications, and spacecraft design.	3	N
SSE 122	Satellites and Space Systems	Topics in SSE 120 in more detail; developing spacecraft subsystems such as structures, electrical power systems, command and data handling, communications, thermal management and operations.	3	N

Program Core Courses				
SSE 210	Spacecraft Mechanical Systems	A first look at computer-assisted development of space vehicle structural and mechanical systems. The course will address fundamental issues of how to build spacecraft: designing structures for space and selecting optimal building materials.	3	N
PHYS 211	Circuits	Analysis of passive linear, time-invariant circuits containing resistors, capacitors and inductors.	4	N
SSE 320	Spacecraft Electronics Systems	An overview of the design of space electronics systems; Development of space electronics systems including power systems, command and data handling systems, attitude determination and control systems, communications systems and payloads and payload interface systems, and electronics systems fabrication, and testing. Skills will be fostered in printed circuit board design and layout, optimization, fabrication, and testing.	3	N
SSE 324	Radio Astronomy	Fundamentals of astronomical observation using radio frequencies.	3	N
SSE 340	Digital Control Systems for Space	An introduction to topics in digital controls; elements of real-time computer architecture, input-output interfaces and data converters; analysis and synthesis of sampled-data control systems using classical and modern methods;	4	N
SSE 360	Advanced Space Systems	An in depth view of the technologies, software, and processes needed to understand and develop spacecraft systems and instrumentation. Specifically, the use of digital processors and software, placing emphasis on the methods used in spacecraft communications, health monitoring and anomaly detection.	3	N
SSE 370	Flight Software Systems	An in-depth presentation of the internals of core flight software running on a real-time operating system (LinuxRT); Operating system hardware and software details, threading, process scheduling, device drivers, and input/output details.	3	Y
SSE 431	Space Plasma Physics	An introduction to plasma physics and its applications to space and astrophysical systems, with an emphasis on the Earth's environment in space.	3	N
SSE 442	RF/Microwave Systems & Antennas	Radio Frequency/Microwave systems and antennas design, analysis, fabrication, test and characterization.	3	N

Program Core Courses				
SSE 444	Satellite Communications	Fundamental concepts of satellite communications including satellite link modulation schemes, error-correction techniques, and spacecraft and ground station hardware and instrumentation.	3	N
SSE 445	Space Systems Communications Lab	Additional lab experience for SSE 444	1	N
SSE 464	Astrodynamics	Concepts related to orbits and satellite motions, ranging from the two-body problem to interplanetary missions.	3	Y
SSE 475	Rocket Propulsion	Fundamental concepts used in rocket engines, including thermochemistry, propulsive parameters, liquid and solid rocket engines. Also will provide a general overview regarding electric and satellite propulsion.	3	Y
SSE 498	Senior Design Project I	Project design and strategic planning in advance of capstone – SSE 499c	2	N
CHEM 111	Principles of Chemistry I	First semester of inorganic chemistry	4	N
MATH 275	Calculus II	Second semester of calculus math	4	N
MATH 276	Calculus III	Third semester of calculus math	4	N
MATH 312	Numerical Methods	Fundamentals of numerical analysis, including error analysis, series approximation, numerical integration techniques, practical applications of matrices, solution of simultaneous nonlinear equations, and curve fitting.	3	Y
PHYS 231	Engineering Physics I	Introduction to physics for scientists and engineers. Motion, statics, kinetics and dynamics of linear and rotational motion. Work, energy and power. Gravitational fields, waves and fluids. Thermal properties of matter and heat transfer.	4	N
PHYS 231A	Engineering Physics I Lab	Lab to accompany Engineering Physics I	1	N
PHYS 232	Engineering Physics II	Continuation of physics for scientists and engineers. Electromagnetism, optics, atomic and nuclear physics.	4	N
PHYS 232A	Engineering Physics II Lab	Lab to accompany Engineering Physics II	1	N
ETM 307	Materials Science	An investigation of engineering materials, including their classification, properties and means of testing to determine their properties. The application of materials to manufactured and constructed products and the effects of manufacturing processes and in-service stress on materials will be considered.	3	Y
EEC 400	Digital Signal Processing	An introduction to concepts of signal processing; fundamentals of DSP methods and applications using the interactive MAT-LAB signal processing tool box.	3	N

Courses in Track/Concentration				
Prefix & Number	Course Title	Course Description	Credit Hours	New Y/N

Guided Elective Courses				
Prefix & Number	Course Title	Course Description	Credit Hours	New Y/N
	Technical elective	Any technical course not used elsewhere in the curriculum	2	N

Free Elective Courses				
Prefix & Number	Course Title	Course Description	Credit Hours	New Y/N

14. Will this program utilize alternative learning formats (e.g., distance learning, technology-enhanced instruction, evening/weekend classes, accelerated courses)? Yes No

• If yes, please check all that apply:

Distance learning: A distance learning course is a course in which the majority of the instruction occurs when students and instructors are not in the same place. Instruction may be synchronous or asynchronous.

Courses that combine various modes of interaction, such as face-to-face, videoconferencing, audio conferencing, mail, telephone, fax, e-mail, interactive television, or World Wide Web

Technology-enhanced instruction

Evening/weekend/early morning classes

Accelerated courses: An accelerated course refers to a course that can be completed in less than a traditional semester.

Instruction at nontraditional locations, such as employer worksite

Courses with multiple entry, exit, and reentry points

Courses with “rolling” entrance and completion times, based on self-pacing

Modularized courses: A module refers to a standalone segment or component of a parent course for which content has been determined and credit assigned. The sum of the constituent modules is equal to the credit of the parent course. Credit is awarded upon successful completion of all modules comprising the parent course

• **Please describe planned alternative methods of program delivery involving greater use of technology, distance education, and/or accelerated degree designs, to increase efficiency, better address student educational and workforce needs, and maximize student success, for both traditional and non-traditional students.**

The Space Science program currently uses, and will continue to use, high-end technology in instruction. All students are involved in “hands-on” projects in most classes that use advanced fabrication equipment (3-D printer, Machine shop), electronic testing equipment, systems testing (vibration testing, thermal-vacuum testing), advanced communications design and characterization, and also mission operations protocols. Work schedules will often include evenings and weekends in order to meet timelines.

Demand

The Program Demand section is similar to the pre-proposal, but prompts for greater detail. Please be sure to provide all requested information, including demand evidence at the regional, state and national levels. Results from student and employer surveys should be included in this section.

1. Student Demand:

Clearly describe all evidence of student demand, typically in the form of surveys of potential students and/or enrollments in related programs at the institution.

A. Provide evidence of student demand at the regional, state, and national levels. Explain how student demand was determined. If student surveys have been collected, provide information regarding sample size, sampling methodology, and response rate.

The demand we observe comes in the form of inquiries and the number of new majors. There is an interest because of the fact that there are a growing number of jobs in the aerospace industry in Kentucky, and most of the students are interested in being able to find work “close to home”.

B. Identify the applicant pool and how they will be reached. If an undergraduate program, please provide information regarding plans to reach first-time freshman and other native students, as well as transfer students.

We have not had issues with recruiting up to this point. For the last three years, we have had 40-45 new freshmen enter the program, and currently have 120 majors. The bulk of the students are contacted during Open Houses and “Meet MSU” nights at outlying locations. We also get a number of students that contact our Enrollment Services Office directly, and we provide perhaps 15-20 tours of the facility each year for prospective students. We have an articulation agreement with KCTCS schools that will facilitates transfer from those schools, and we are in the process of updating that with current curriculum.

C. Describe the student recruitment and selection process. Describe the processes for recruitment and the admission criteria for both native and transfer students.

They are recruited mainly through Open Houses and “Meet MSU” nights. There are no admission criteria beyond those for the university.

D. Identify the primary feeders for the program. List the colleges, schools, programs from which students for this program will be recruited.

The primary feeders for this program are high school students. They are recruited mainly through Open Houses and “Meet MSU” nights. This has worked for the last several years, resulting in 40-45 new students every year.

E. Provide any evidence of a projected net increase in total student enrollments to the campus as a result of the proposed program. Will this program increase the overall enrollment on campus? If so, describe how.

This program is a continuation of an existing program, albeit under a different name and CIP code. Over the last eight years, we have seen the following growth in the program:

2011-12	39
2012-13	45
2013-14	58
2014-15	62
2015-16	80
2016-17	103
2017-18	104
2018-19	120

Growth is likely to continue only moderately, perhaps to 140 by 2023-24.

F. Project estimated student demand for the first five years of the program. Provide as accurate projections as possible based on 1a.

Academic Year	Degrees Conferred	Majors (Headcount) – Fall Semester
2019-20	8	120
2020-21	12	125
2021-22	15	130
2022-23	15	135
2023-24	15	140

2. Employer Demand:

Clearly describe evidence of employer demand. Such evidence may include employer surveys, current labor market analyses, and future human resources projections. Where appropriate, evidence should demonstrate employers' preferences for graduates of the proposed program over persons having alternative existing credentials and employers' willingness to pay higher salaries to graduates of the proposed program.

Describe the types of jobs available for graduates, average wages for these jobs, and the number of anticipated openings for each type of jobs at the regional, state, and national levels.

Use all available data to make this section as specific as possible. Be sure to include information from regional, state and national market analyses.

Over the past five years, aerospace exports in Kentucky have begun to take off. In the early 2000s, aerospace exports hovered slightly over a few billion dollars. By 2013, however, export activity started to change and in 2015, Kentucky generated over \$8.7 billion in exports. This surge was enough to push the Commonwealth to third nationally in export activity. This sweeping growth was quickly recognized, and in the 2015 legislative session, the General Assembly passed House Joint Resolution 100 to mandate a study of the aviation, aerospace, and defense supply chains. Through intense and thorough research, it has uncovered and highlighted many of the incredible statistics, companies, universities, and research underway throughout our state. By the end of 2016, Kentucky's aerospace exports had grown to \$10.85 billion, which makes the Commonwealth second in the United States, behind only the state of Washington.¹ This industry is poised to have an enormous and positive impact for all Kentuckians.

Aerospace growth goes beyond just exports for Kentucky. It has also expanded in the number of companies involved and the individuals looking to make an impact in this arena. As aerospace product manufacturing began to rise regionally many of these companies that made pieces and parts for automobiles, began to use their skills and capabilities to do the same thing within the aerospace industry. At the beginning of its study, the Kentucky Cabinet for Economic Development listed 60 companies involved in aerospace in the state. Through the study, it was discovered that Kentucky is home to more than 600 businesses involved in the aerospace and aviation cluster. *These companies range from large to small and account for over 17,500 jobs in Kentucky alone.*²

Additionally, Kentucky's Aerospace Products and Aviation Services workers differ from Kentucky's total workforce in an important and relevant way. There is a particularly large concentration of 45 to 64 year olds—51% of Aerospace and Aviation workers are in this age group, but just 38% of Kentucky's total workforce is in this group. This means that a large percentage of workers may be aging out of the Aerospace and Aviation workforce over the next 10 to 15 years.³

¹ Kentucky Commission on Military Affairs and the Commonwealth of Kentucky, "The Kentucky Aerospace and Aviation Industry Study", May 2017

² <http://thinkkentucky.com/Aerospace/Workforce.aspx>

³ Emsi 2016.3. Jobs are for workers in 6-digit NAICS industries. Industry Overview

The job market is therefore robust for the graduates in Space Science. With approximately 100% job placement, our graduates have gone on to work in many prestigious government aerospace laboratories and at well-known aerospace and defense companies in Kentucky and beyond. These include:

- NASA JPL
- NASA Johnson Space Center
- NASA Glenn Research Center
- ViaSat
- Tyvak
- Rajant
- Space Micro
- Space Dynamics Laboratory

Transitioning the Space Science B.S. to the Space Systems Engineering B.S. will no doubt increase the competitiveness of our graduates and lead to an expansion of this list.

The Space Science program has been directly involved in research and the economic and community development for the region surrounding Morehead, Kentucky. The external demand for the B.S. in Space Science is real and significant. The United States is facing a critical shortage of qualified professionals in many areas, with engineering and space sciences being among the most crucial. More than any other nation, the United States utilizes space for economic, political, and defense needs, and much of our economy depends on space which translates to a robust job market. There is a significant need in the workforce for the type of engineer that this program will produce. Fifteen percent of the US Gross Domestic Product is now related to aerospace and the aerospace industry supports over 15 million high quality American jobs. The space sector of the US economy, which includes manufacturing and service components, did not experience the recession of 2008-2010, in fact the aerospace industry has experienced eight consecutive years of growth, booking a strong performance in 2013. Annual sales reached \$314.17 billion in 2013 (representing 4% growth over 2012), making aerospace one of the most significant contributors to the US economy⁴⁵⁶.

While the U.S. Space Economy has been robust, an interesting and relevant phenomena occurred in 2013; *Aerospace became Kentucky's Number One Export*. In 2013, and, for the third straight year, Kentucky's exports set a new all-time annual record. Governor Steve Beshear announced the new mark of \$25.3 billion in sales of Kentucky-made products and services in 2013 in a report from the Cabinet for Economic Development released on February 13, 2014.⁷ The report indicated,

“Leading Kentucky’s export growth is aerospace products (\$5.6 billion), followed by motor vehicles and parts (\$5.5 billion) and synthetic rubber and resin (\$1.4 billion).”

By comparison, sales in bourbon industry dropped 2.74 percent, to \$142 million, according the Kentucky Cabinet for Economic Development.

The job market for all areas of the space sector including aerospace engineers, electrical and mechanical engineers, technicians, Earth station operators, and micro-nanotechnology engineers is robust—all epitomizing 21st century jobs. The US Bureau of Labor Statistics reports basic statistics on employment for all fields and runs statistical projections for employment outlook. The job market in 2013 was very favorable in aerospace and the outlook five years out is also favorable (predicting 7+% growth for aerospace engineers and 10% growth for physicists and astronomers).

The occupation employment definition for aerospace engineers indicate that they perform engineering duties in designing, constructing, and testing aircraft, missiles, and spacecraft. They conduct basic and applied research to

⁴ The Space Report 2013, Space Foundation, Colorado Springs, CO 2013

⁵ The Space Report 2012, Space Foundation, Colorado Springs, CO 2012

⁶ The Space Report 2014, Space Foundation, Colorado Springs, CO 2014

⁷ Commonwealth of Kentucky, Cabinet for Economic Development News Release February 13, 2014. Expert from ThinkKentucky.com https://www.thinkkentucky.com/newsroom/NewsPage.aspx?x=02132014_exports.html

evaluate adaptability of materials and equipment to aircraft design and manufacture. Employment figures for the three most relevant occupations for our graduates for 2012 (the most recent year for which statistics are available) are shown below.⁸

Employment projections data for aerospace engineers, 2012-22

Occupational Title	SOC Code	Employment, 2012	Projected Employment, 2022	Change, 2012-22		Employment by Industry
				Percent	Numeric	
Aerospace engineers	17-2011	83,000	89,100	7	6,100	[XLS]

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

Employment projections data for aerospace engineering and operations technicians, 2012-22

Occupational Title	SOC Code	Employment, 2012	Projected Employment, 2022	Change, 2012-22		Employment by Industry
				Percent	Numeric	
Aerospace engineering and operations technicians	17-3021	9,900	9,900	0	0	[XLS]

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

Employment projections data for electro-mechanical technicians, 2012-22

Occupational Title	SOC Code	Employment, 2012	Projected Employment, 2022	Change, 2012-22		Employment by Industry
				Percent	Numeric	
Electro-mechanical technicians	17-3024	17,300	18,000	4	700	[XLS]

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

Given this background, our program for the past 10 years or so has been aimed at providing the knowledge and skills necessary for students to succeed in the high-tech industries that are now a major player in Kentucky and the nation. We are proposing the formal recognition through the CIP code change that this is a *bona fide* engineering program.

3. Academic Disciplinary Needs:

Clearly describe all evidence justifying a new program based on changes in the academic discipline or other academic reasons.

This program is not an entirely “new” program, and more correctly is a change in CIP code to more accurately reflect the program content. The program has 120 students, is very active, and has morphed into a true “engineering” program, thus justifying the switch to CIP 14.

If the proposed program is an advanced practice doctorate, explain the new practice or licensure requirements in the profession and/or requirements by specialized accrediting agencies that necessitate a new doctoral program.

N/A

⁸ US Department of Labor Bureau of Labor Statistics website <http://data.bls.gov>, 2013

4. **Similar programs:** A new program may serve the same potential student population, the proposed program must be sufficiently different from existing programs in the state or access to existing programs must be sufficiently limited to warrant initiation of a new program.

A. **Are there similar programs in other Southern Regional Education Board (SREB) states and in the nation?**

Yes **No** If yes, please identify similar programs in other SREB states and in the nation. (SREB states include Alabama, Arkansas, Delaware, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.)

There are no similar programs in the Commonwealth of Kentucky. There is only one other program on the inventory list with the CIP 14.0201 code, namely the Embry-Riddle Aeronautical University Worldwide in Louisville. The bachelor's degrees they offer include one in basic engineering and others that are aviation-related. The bachelor's from the proposed program herein is specific to Astronautical Engineering, which is unique in the Commonwealth as to scope. The curricular emphasis on the design, fabrication, and testing of *SPACE systems* (payload, power, data processing, communication, control), added to the experience of on-orbit operations provides knowledge and skills available nowhere else in the Commonwealth of Kentucky.

In the nation, there are five other undergraduate space science (or astronautical engineering) programs:

BS in Space Science- Morehead State University
BSc in Space Studies- American Public University
BS in Aeronautics and Astronautical Engineering- The Ohio State University
BS in Aerospace and Astronautics- Cal Poly San Luis Obispo
BSc in Aeronautics and Astronautics- Stanford

There is also the closely related
BS in Space Physics Embry-Riddle Aeronautical University

Of these, only American Public University and Embry-Riddle are in the SREB states (Virginia & West Virginia for APU, and Florida for ER). None of the five has programs that are truly parallel. American Public University, while having offices in WV and VA, is a fully online curriculum in Space Studies, and only has 12 courses, several of which are not related to engineering directly. The program at Ohio State University is mainly aerospace, with two courses in space vehicle design. The programs in California (Cal Poly and Stanford do have more space-related courses, but include other general engineering (mechanical & electrical) as well as several aerospace engineering courses. The program at Embry Riddle (at campuses located in Florida and Arizona) is basically only aerospace, with some discussion of space-related topics.

As such, the program proposed herein is quite different from three of the others and sufficiently different from the two in California.

B. **If similar programs exist in Kentucky,**

- **Does the proposed program differ from existing programs?** **Yes** **No** If yes, please explain.

There is only one other program on the inventory list with the CIP 14.0201 code, namely the Embry-Riddle Aeronautical University Worldwide in Louisville. The bachelor's degrees they offer include one in basic engineering and others that are aviation-related. The bachelor's from the proposed program herein is specific to Astronautical Engineering, which is unique in the Commonwealth as to scope. The curricular emphasis on the design, fabrication, and testing of *systems* (payload, data processing, communication, control), added to the experience of on-orbit operations provides knowledge and skills available nowhere else in the Commonwealth of Kentucky.

- **Does the proposed program serve a different student population (i.e., students in a different geographic area) from existing programs?** **Yes** **No** If yes, please explain.

- Is access to existing programs limited? Yes No If yes, please explain.
- Is there excess demand for existing similar programs? Yes No If yes, please explain.
- Will there be collaboration between the proposed program and existing programs? Yes No If yes, please explain the collaborative arrangements with existing programs. If no, please explain why there is no proposed collaboration with existing programs.

The one existing program, the Embry-Riddle Aeronautical University Worldwide in Louisville, is not sufficiently related to form a collaboration. It is mainly Aeronautical Engineering, and ours is Astronautical Engineering.

Cost

The resource requirements and planned sources of funding of the proposed program must be detailed in order to assess the adequacy of the resources to support a quality program. This assessment is to ensure that the program will be efficient in its resource utilization and to assess the impact of this proposed program on the institution's overall need for funds.

- A. Will this program require additional resources? Yes No If yes, provide a brief summary of additional resources that will be needed to implement this program over the next five years. Resources include staffing, equipment, laboratory apparatus, etc.
- B. Will this program impact existing programs and/or organizational units within your institution?
 Yes No

What programs will be closed or what resources will be impacted by the proposed program?

The "Yes" response is a formality. The existing Bachelors in Space Science will be closed and replaced by the Space Systems Engineering program proposed herein. The programs are essentially identical with respect to curriculum, so there is no anticipated impact.

- C. Provide adequate documentation to demonstrate sufficient return on investment to the state to offset new costs and justify approval for the proposed program.
- Will the program increase retention rates, and, therefore generate tuition dollars? Will the program increase revenue by attracting a new pool of students? Will graduates fill employment needs in the state? Will graduates likely continue their studies in an advanced degree that has been shown to be beneficial to the economic needs of the state?
 - If no new costs are anticipated, please explain why.

As this program is basically replacing an already existing program, there are no significant new costs. The program has morphed into an engineering program and we are requesting a name change and a change in CIP code.

Please complete the following tables.

Be sure to provide any preproposal updates and justification for all sections that include costs.

Funding Sources, by year of program		1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year
Total Resources Available from Federal Source If amount other than \$0, please provide narrative explanation/justification. Federal sources include grants, earmarks, etc.	New	-0-	-0-	-0-	-0-	-0-
	Existing	-0-	-0-	-0-	-0-	-0-
Narrative Explanation/Justification:						
Total Resources Available from Other Non-State Sources If amount other than \$0, please provide narrative explanation/justification. Non-state sources include philanthropies, foundations, individual donors, etc.	New	-0-	-0-	-0-	-0-	-0-
	Existing	-0-	-0-	-0-	-0-	-0-
Narrative Explanation/Justification:						
State Resources If amount other than \$0, please provide narrative explanation/justification. State sources include general fund revenue, grants, pass-thru funds, etc.	New	-0-	-0-	-0-	-0-	-0-
	Existing	180,840	180,840	180,840	180,840	180,840
Narrative Explanation/Justification: This amount reflects the cost of the Department Chair, Academic Department Specialist, and the department budgetary allotments for basic things like Supplies, Travel, copies, etc.						
Internal If amount other than \$0, please provide narrative explanation/justification. The source and process of allocation and reallocation should be explained, including an analysis of the impact of the reduction on existing programs and/or organization units.	Allocation	-0-	-0-	-0-	-0-	-0-
	Reallocation	459,529	459,529	459,529	459,529	459,529
Narrative Explanation/Justification: (The source and process of allocation and reallocation should be detailed, including an analysis of the impact of the reduction on existing programs and/or organization units) This "Reallocation" are funds from within the Space Science Center R&D unit that are expended in support of the Space Science program. SSC staff teach our courses, student employees are paid, and administrative work is done. As this is part of the expectations within the SSC, no additional impact is present. Funds for student employees include \$27,972 from Federal sources (NASA) and \$9496 from the private sector.						

Student Tuition In narrative explanation/justification, please describe how student tuition figures were calculated (e.g., X students per semester multiplied by tuition rate, plus fees.)	New	-0-	45,350	49,826	45,350	49,826
	Existing	1,142,112	1,142,112	1,187,462	1,237,288	1,282,638
Narrative Explanation/Justification: Describe how student tuition figures were calculated (e.g., X students per semester multiplied by tuition rates, plus fees.) Currently, there are 120 majors (full-time) in Space Science, of which we are assuming 10% (12 students) are out of state. Using the in-state tuition rate of \$8750 per year and out of state of \$13226, and mandatory fees of \$320 per year, that gives an existing value of \$1,142,112. For years 2-5, we are assuming a net growth of five per year, (125 in year 2, 130 in year 3, 135 in year 4, and 140 in year 5). In these five students each year, we are assuming an additional out of state student in years 3 and 5.						
TOTAL		1st Year	2nd Year	3rd Year	4th Year	5th Year
	New	-0-	45,350	49,826	45,350	49,826
	Existing	1,782,481	1,782,481	1,827,831	1,877,657	1,923,007
	TOTAL	1,782,481	1,827,831	1,877,657	1,923,007	1,972,833

This section is identical to the pre-proposal Cost section. Please provide any updates, and ensure that all relevant narrative explanation/justification have been completed.

Please provide narrative explanation/justification in the last box of the staff category		1st Year	2nd Year	3rd Year	4th Year	5th Year
Staff: Executive, Administrative, Managerial	New	-0-	-0-	-0-	-0-	-0-
	Existing	198,902	198,902	198,902	198,902	198,902
Staff: Other Professional	New	-0-	-0-	-0-	-0-	-0-
	Existing	342,884	342,884	342,884	342,884	342,884
Staff: Faculty Identify the number (and cost) of new faculty required and whether they will be part-time or full-time.	New					
	Part-Time	-0-	-0-	-0-	-0-	-0-
	Full-Time	-0-	-0-	-0-	-0-	-0-
	Existing	-0-	-0-	-0-	-0-	-0-
Graduate Assistants Only if program is at the master's or doctoral level Identify the number (and cost) of assistantship/stipends that will be provided. Include level of support for each.	New	N/A	N/A	N/A	N/A	N/A
	Existing	N/A	N/A	N/A	N/A	N/A
Student Employees	New	-0-	-0-	-0-	-0-	-0-
	Existing	93,894	93,894	93,894	93,894	93,894

Narrative Explanation/Justification:
Administrative and Managerial Staff consist of the Department Chair (Eric Jerde), The Academic

Department Specialist (Alicia Poage), and 35% of the effort of the Administrative Assistant within the Space Science Center (Amanda Holbrook). The table below summarizes the costs for these three positions:

Name	Salary	Benefits	Sub-Total	Fract w/EASS	Total Cost
Dept. Chair	89,984	29,885	119,869	1.00	119,869
Academic Departmental Specialist	28,392	27,890	56,282	1.00	56,282
Space Science Center Admin Assistant	40,502	24,502	65,004	0.35*	22,751
					198,902

*This amount reflects the time spent administering the various types of student employees.

All Instruction within the department in support of the Space Systems Engineering program will be done by faculty affiliates attached to the Space Science Center (SSC), as has been done for several years. The table below shows the cost for each of the SSC instructional staff:

Name	Salary	Benefits*	Sub-Total	Fract Teaching [#]	Total Cost
Affiliate 1	79,377	27,549	106,926	0.50	53,463
Affiliate 2	76,000	26,755	102,755	0.25	25,689
Affiliate 3	71,451	25,685	97,136	0.65	63,138
Affiliate 4	60,000	22,992	82,992	0.75	62,244
Affiliate 5	86,600	29,248	115,848	0.50	57,924
Affiliate 6	79,627	27,608	107,235	0.75	80,426
					342,884

*Benefits calculated as Salary X 0.2352 + 8,880

[#]The fraction of time devoted to teaching varies due to varying allocation of time for contracts and grants. These are representative 3 semester averages.

Equipment and Instructional Materials If amount other than \$0, please provide narrative explanation/justification. Explain the types of equipment and instructional materials that will be purchased as a result of the proposed program.						
	New	-0-	-0-	-0-	-0-	-0-
Existing	-0-	-0-	-0-	-0-	-0-	-0-

Narrative Explanation/Justification: Explain the types of equipment and instructional materials that will be purchased as a result of the program: Equipment is part of the Space Science Center Research and Development (R&D) enterprise, and not the Earth and Space Sciences Department. No new equipment is anticipated.

Library If amount other than \$0, please provide narrative explanation/justification. Amount should include new journal subscriptions, collections, and electronic access.	New	-0-	-0-	-0-	-0-	-0-
	Existing	-0-	-0-	-0-	-0-	-0-
Narrative Explanation/Justification:						
Contractual Services If amount other than \$0, please explain the types of contractual services that will be procured.	New	-0-	-0-	-0-	-0-	-0-
	Existing	-0-	-0-	-0-	-0-	-0-
Narrative Explanation/Justification: Explain the types of contractual services						
Academic and/or Student Services If amount other than \$0, please explain the types of academic and student support services that will be provided by the proposed program.	New	-0-	-0-	-0-	-0-	-0-
	Existing	-0-	-0-	-0-	-0-	-0-
Narrative Explanation/Justification: Explain the types of academic and student support services that will be provided by the proposed program						

Other Support Services If amount other than \$0, please explain what support services will be provided.	New	-0-	-0-	-0-	-0-	-0-
	Existing	-0-	-0-	-0-	-0-	-0-
Narrative Explanation/Justification: Explain what support services will be provided						
Faculty Development If amount other than \$0, please explain how this money will be used (travel, conferences registrations, on-site consultants, etc.)	New	-0-	-0-	-0-	-0-	-0-
	Existing	-0-	-0-	-0-	-0-	-0-
Narrative Explanation/Justification: Explain how the money will be used (travel, conferences registration, on-site consultants, etc.) No "Faculty" exist. Staff used for instruction are attached to the Space Science Center R&D.						
Assessment Includes major field exam costs, costs associated with licensure testing (e.g., NCLEX), etc. If amount other than \$0, please provide narrative explanation/justification.	New	-0-	-0-	-0-	-0-	-0-
	Existing	-0-	-0-	-0-	-0-	-0-
Narrative Explanation/Justification:						
Student Space and Equipment Include only if proposed program is a doctorate. If amount other than \$0, please provide an explanation of student space that must be procured and any equipment for student use that must be purchased.	New	N/A	N/A	N/A	N/A	N/A
	Existing	N/A	N/A	N/A	N/A	N/A
Narrative Explanation/Justification: Provide an explanation of student space that must be procured and any equipment for student use that must be purchased.						
Faculty Space and Equipment Include only if proposed program is a doctorate. If amount other than \$0, please provide an explanation of space and equipment that must be procured for program faculty.	New	N/A	N/A	N/A	N/A	N/A
	Existing	N/A	N/A	N/A	N/A	N/A

Narrative Explanation/Justification: Please provide an explanation of space and equipment that must be procured for program faculty.						
Other If amount other than \$0, please provide narrative explanation/justification.	New	-0-	-0-	-0-	-0-	-0-
	Existing	-0-	-0-	-0-	-0-	-0-
Narrative Explanation/Justification:						

ASSESSMENT

This assessment section is one of the sections that elicit the most questions/comments during the 45-day pre-proposal review period. Please revise accordingly if questions/comments were raised during the pre-proposal. Please note that this item refers to *program-level*, not *course-level* assessment. Course grades are not an appropriate source of data for program-level assessment.

1. Identify both the direct and indirect methods by which the intended student learning outcomes will be assessed.

This item is included on the pre-proposal. Describe the program's plan for assessing student learning. The description should include plans for annual evaluation of program-level student learning outcomes.

A. Include all direct and indirect assessment methods used to evaluate program level learning outcomes.

- Direct measures provide direct observation or examination of student knowledge or skills (i.e., attainment of student learning outcome). Examples include locally developed exams, portfolios (evaluated via a rubric), course-embedded assignments (papers, exam questions, etc.; evaluated via a rubric), standardized exams, oral exam (evaluated via a rubric), pre/post tests, capstone course evaluation. For further explanation and examples, please see: <http://www.ccaurora.edu/students/academic-support/testing/assessment-testing/direct-indirect>

1. **Laboratory Competence** -Students will demonstrate the ability to collect and analyze data.
Assessed via laboratory assignments in SSE 105 and SSE 122 – In these courses, students will be given individual assignments that require using electronic instrumentation to collect and plot data, and will analyze the results.
2. **Substantive Research Experience** – Students will have participated in more than one active research project related to activities in the Space Science Center.
Assessed via research presentations - Prior to graduation, majors will have completed research projects that result in a competent presentation at a technical meeting.
3. **Use computers and high-tech instrumentation** – Students will demonstrate the ability to use computers and high-tech instrumentation to monitor and control technical systems.
Assessed via a project using high-tech instrumentation – Competence will be measured using a project in SSE 340 and/or SSE 360 using computers and high-tech instrumentation.
4. **Knowledge of spacecraft subsystems** – Students will demonstrate knowledge of spacecraft systems including power generation and distribution, radio communication, electronic components, and flight software architecture.
Assessed via final exams in courses covering spacecraft subsystems – Knowledge will be measured using comprehensive final exams in SSE 122, SSE 340, SSE 360, and SSE 498, if appropriate.

5. **Competent communication** – Students will demonstrate competency in communication through factual accuracy, proper terminology, and completeness. Assessment will be through two means:
- A. Capstone Presentation* – Students will give a technical presentation that is easy to follow, focused on the selected topic, substantial in content, free of major technical errors, and delivered within standard time limits.
- B. Capstone Report* – Students will produce a technical report. The written report must be well organized, easy to read and understand, properly formatted, focused on the selected topic, substantial in content, and free of major technical errors.

6. **Ability to integrate knowledge** – Students will demonstrate the ability to integrate the knowledge gained from multiple courses.
- Assessed via Technical Project Design* – Students design a technical project for the capstone course. The project must integrate knowledge and skills developed in earlier courses in the program and it must outline steps to bring the project to completion in a timely fashion.

- Indirect assessments measure the perceived extent or value of learning experiences. Indirect measures can provide important information, such as students' attitudes toward the program or employers' experiences with your alumni that cannot be obtained via direct measures. Examples include exit surveys, student focus group results, employer surveys. For further explanation and examples, please see: <http://www.ccaurora.edu/students/academic-support/testing/assessment-testing/direct-indirect>

B. Explain which student learning outcome(s) will be assessed by each assessment method and how *frequently* each assessment method is administered.

- For example, suppose a proposed program has seven program-level student learning outcomes. Three of these seven outcomes may be assessed annually via a major field exam administered to graduating seniors. Six out of the seven may be assessed annually via a portfolio review. One outcome might be evaluated via embedded assessments in freshman level and senior level courses. Please account for the assessment of each program level student learning outcome.
- Most importantly, explain how assessment results will be used to make improvements to the program.
- Please note that this item refers to program-level, not course-level, assessment. Course grades are not an appropriate source of data for program-level assessment.
- Please note that this question is one of the most frequently commented-upon questions within the pre-proposal. If you have further questions about the information requested in the assessment tab, please contact the CPE institutional representative, who will provide a list of resources.

Since all of these courses and objectives are offered every year, assessment of the outcomes will be measured each year, as described in item 1 above. This is done through the campus-wide program assessment protocol (WEAVE). Each year, the results will be evaluated by the Space Science Center instructional staff providing the content, and adjustments to course materials, curriculum, or mentoring will be made. As an example, when SSE 105 was offered in Fall 2017, there were significant gaps in the students' success with the labs, and it was determined that this was likely due to an excessively heavy workload in the course in the mid-portion of the semester. As a result, the course was modified to have a slightly smaller load, and have it spread out more evenly during the semester.

I. CATALOG COPY

Please provide the verbiage as you would like for it to appear in the MSU Undergraduate catalog.

Earth and Space Sciences Department

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Affiliates

K. Brown (faculty affiliate), M. Combs (engineer affiliate), J. Kruth (engineer affiliate), B. Malphrus (faculty affiliate), R. Twiggs (faculty affiliate), C. Conner (engineer affiliate), J. Samson (MSU research affiliate), K. Romig (MSU research affiliate)

Space Systems Engineering

The program in space systems engineering is one of distinctively few such programs nationwide offered at the undergraduate level. The presence of the 21-meter space tracking antenna and radio telescope on campus and the availability of the extraordinary facilities in the Space Science Center for our students and faculty for instruction and research provide a solid foundation for the program. Excellent faculty with diverse backgrounds in space related science and technology allow students to tap the full potential of our state-of-the-art facilities. Graduates from the program will have a breadth of knowledge, experience, skills and adaptability — the marketable tools of new and exciting professional careers in space science, aerospace and the telecommunications industry.

The main goal of this program is to prepare graduates for professional opportunities in applied technologies such as astronomical engineering, space system development and testing, satellite tracking and telemetry, and telecommunications electronics. The program provides a broad but sound education in the basic physical and mathematical sciences, as well as specialized instruction in astronomy, astrophysics, electronics, space systems, and satellite technology. Research opportunities in astrophysics, space systems, engineering, engineering technology, and telecommunications are also available through the space systems engineering program. Graduates of this program will be particularly well qualified to seek positions with NASA, aerospace companies, public and private science organizations, research facilities, colleges, and in other commercial industries.

Space Systems Engineering Area – Bachelor of Science

The Bachelor of Science in Space Systems Engineering is an interdisciplinary degree program, and requires students to complete requirements in physics, mathematics, electricity-electronics-telecommunications technology and astronomy-space science.

Program Competencies

The student will:

1. Develop the basic competencies in system engineering and gain familiarity with the concepts and technologies associated with aerospace systems requirements, particularly spacecraft and related subsystems.
2. Learn how to use basic laboratory instrumentation and acquire skills that permit a rapid start in practical "real world" applications in the workplace.
3. Understand issues common to all radio frequency based communications systems, specify relevant system components, participate in design trade studies, perform field/laboratory work at the engineering technologist level, prepare technical reports including studies and analyses and have sufficient preparation to be able to quickly assimilate new technical information.
4. Be prepared to enter the workforce as an entry-level systems engineer or engineering technologist with the ability to integrate the knowledge gained in coursework with the necessary skills of self-direction and research/project implementation.
5. Have an understanding of semiconductor physics, atomic bonding, and crystal structures and imperfections that ultimately dictate the physical and mechanical properties of the materials. Students will also be familiar with processes leading to materials failure, such as thermal, radiative, erosive and corrosive degradations, as well as the corresponding protection approaches as related to the extreme conditions of the space environment.
6. Become familiar with a variety of government and commercial professional opportunities in addition to those in the space industry. These include opportunities in commercial satellite services, space commercial transportation services, space tourism, direct-to-home television, GPS telecommunications, electronics, technical marketing, electronics instrumentation and defense technologies.

Assessment

1. Performance on the senior research or design project
2. Performance in individual courses

3. Acceptance rates into job market and/or graduate school

Program Requirements

General Education

MATH 175	Calculus I	4
ASTR 125	Astronomical and Physics Methods to Explore the Universe (NSC2)	3
SSE 499C	Senior Design Project II	3

Subtotal: 37

Refer to the General Education section for a complete listing of general education requirements for the University.

Area Requirements

Space Science Core

CHEM 111	Principles of Chemistry I	4
SSE 105	Introduction to Electronic Processes	3
SSE 120	Satellites and Space Systems I	3
SSE 122	Satellites and Space Systems II	3
SSE 210	Spacecraft Mechanical Systems	3
PHYS 211	Circuits	4
SSE 320	Spacecraft Electronic Systems	3
SSE 324	Principles of Radio Astronomy	3
SSE 340	Digital Control Systems for Space Applications	4
SSE 360	Advanced Space Systems	3
SSE 370	Flight Software Systems	3
SSE 431	Space Plasma Physics	3
SSE 442	RF/Microwave Systems & Antennas	3
SSE 444	Satellite Communications	3
SSE 445	Space Systems Communications Laboratory	1
SSE 464	Astrodynamics	3
SSE 475	Rocket Propulsion	3
SSE 498	Senior Design Project I	2
ETM 307	Materials Science	3
EEC 400	Digital Signal Processing I	3

Subtotal: 60

Additional Program Requirements

Mathematics

MATH 275	Calculus II	4
MATH 276	Calculus III	4
MATH 312	Numerical Methods	3

Subtotal: 11

Physics

PHYS 231	Engineering Physics I	4
PHYS 231A	Engineering Physics I Lab	1
PHYS 232	Engineering Physics II	4
PHYS 232A	Engineering Physics II Lab	1

Subtotal: 10

Technical Electives

Choose two credit hours from the following:

ASTR 403	Astrophysical Instrumentation & Payloads	3
ASTR 460	High Energy Astrophysics	3
MATH 363	Differential Equations	3
PHYS 332	Electricity and Magnetism	4
PHYS 361	Fundamentals of Electronics	3
ESS 303	Planetary Geology	3
SSE 476	Directed Research	1-6
SSE 299	Selected Topics in Space Science and Engineering	3
SSE 399	Selected Topics	1-4

Subtotal: 2

ASTR 460 requires prerequisite MATH 276.

Total Credit Hours: 120

Courses

SSE - Space Science and Engineering

SSE 105 - Introduction to Electronic Processes

(2-2-3) Emphasis will be placed on physical realization of electronic assemblies, fundamental electrical calculations, operation of basic test and measurement equipment, development of skills such as soldering, mechanical systems design, wiring, and packaging. Numerous projects will be undertaken by each student to facilitate development of these skills.

Corequisite: SSE 105L

SSE 120 - Satellites and Space Systems I

(2-2-3) Introduction to satellites and space systems; orbital mechanics; the space environment; satellite applications; spacecraft design considerations; roles played by universities, industries, and government in space exploration and utilization; and future technologies of spacecrafts and satellites. Laboratory sessions will give hands-on experience in the fabrication and assembly of spacecraft components.

Prerequisite: MATH 174 or MATH 175 or ACT Math subscore of 22

Corequisite: SSE 120L

SSE 122 - Satellites and Space Systems II

(2-2-3) SSE 122 is a continuation of SSE 120. It covers the topics that were introduced in SSE 120 in more detail with examples in developing spacecraft subsystems such as structures, electrical power systems, command and data handling, communications, thermal management and operations. Laboratory session will give hands on experience in the fabrication and assembly of spacecraft components.

Prerequisite: Take SSE 120 and MATH 174 or MATH 175

Corequisite: SSE 122L

SSE 123 - Concepts and Experiences in Energy

(3-0-3) An interdisciplinary approach to the study of energy. Incorporates experiences and concepts from motion, heat, light, magnetism, electricity, radioactivity and sound waves. This course satisfies the NSC II requirement for general education.

Equates with ETM 123, PHYS 123 and SCI 123.

SSE 199 - Special Topics

(1-6 hrs.)

SSE 210 - Spacecraft Mechanical Systems

(2-2-3) This course provides the student with a first look at computer-assisted development of space vehicle structural and mechanical systems. The course will address fundamental issues of how to build spacecraft: designing structures for space and selecting optimal building materials. The response of space structures to the extreme thermal conditions, vibration environment during launch, response to the space radiation and vacuum environments will be considered. Students will develop skills in SolidWorks, parametric 3-D modeling, machined components design and machine tooling.

Prerequisite: SSE 120

Corequisite: SSE 210L

SSE 299 - Selected Topics in Space Science and Engineering

(3-0-3) Investigation of specific topics in space sciences, astronautical engineering, satellite systems and space mission operations.

SSE 320 - Spacecraft Electronic Systems

(2-2-3) This course provides the student with an overview of and a beginning skillset in the design of space electronics systems. The development of space electronics systems including power systems, command and data handling systems, attitude determination and control systems, communications systems and payloads and payload interface systems require an understanding of electrical/electronic design, and electronics systems fabrication, and testing. Specific skills will be fostered in printed circuit board design and layout (using the Altium software system), optimization, fabrication, and testing. These processes are addressed through project-based learning.

Prerequisite: SSE 122, SSE 210 and PHYS 211/211L

Corequisite: SSE 320L

SSE 324 - Principles of Radio Astronomy

(3-0-3) A study of astrophysically interesting phenomena utilizing the techniques of the science of radio astronomy; topics include galactic structure, radio galaxies, cosmic jets and black holes, interstellar molecules and instrumentation in radio astronomy, with a major emphasis in the methods of research in experimental astrophysics. Equates with ASTR 324 and PHYS 324.

Prerequisite: PHYS 232 and ASTR 125

SSE 339 - Cooperative Education I

(1-6 hrs.) Petition required. Participation in supervised work experience in a professional environment.

SSE 340 - Digital Control Systems for Space Applications

(3-2-4) This course is a comprehensive introduction to digital control systems for space applications. A presentation of fundamental topics in digital controls is reinforced with hands-on laboratory experience. The course covers elements of real-time computer architecture; input-output interfaces and data converters; analysis and synthesis of sampled-data control systems using classical and modern (state-space) methods; analysis of trade-offs in control algorithms for computation speed and quantization effects. Laboratory projects emphasize practical digital servo interfacing and implementation problems with timing, noise and nonlinear devices.

Prerequisite: SSE 105, SSE 122

Corequisite: SSE 340L, PHYS 211/211L

SSE 341 - Solid-State Electronic Devices and Applications

(3-0-3) This course covers the fundamental concepts and operational principles of semiconductor devices and their applications. The course content includes semiconductor materials, carriers in semiconductors, energy bands, Fermi-Dirac distribution, p-n junctions, metal-semiconductor junction, field-effect transistors, bipolar junction transistors, high-speed transistors, solar cells, detectors and sensors as well as their applications, especially in space. The degradation and protection of semiconductor devices in space are introduced. Lab activities are embedded in the course.

Prerequisite: EEC 141 and PHYS 232

SSE 360 - Advanced Space Systems

(3-0-3) Advanced Space Systems Engineering provides an in-depth view of the technologies, software, and processes needed to understand and develop spacecraft systems and instrumentation. Specifically, the course will cover the use of digital processors and software and place emphasis on the methods used in spacecraft communications, health monitoring and anomaly detection and resolution. The emphasis will be on how current technology is incorporated into the planning, designing, fabrication, integration and testing of modern space systems.

Prerequisite: SSE 340

SSE 370. Flight Software Systems

(3-0-3). An in-depth presentation of the internals of core flight software running on a real-time operating system (LinuxRT). Covered in this course are operating system hardware and software details, threading, process scheduling, device drivers, and input/output details.

Prerequisites: PHYS 232 and MATH 276.

SSE 380 - Materials Science for Space Applications

(3-0-3) Materials fundamentals of atoms and molecules, atomic bonding, crystal structures and defects, atomic diffusion, thermal behavior, radiative and thermal degradation, solidification and phase diagrams are introduced. Various types of materials and coatings that function properly in the extreme conditions of the space environment, such as ionizing radiation, corrosion, erosion

and extreme temperatures are studied. Materials studied include iron, aluminum, titanium, nickel and refractory alloys, polymers, ceramics and composites. The coatings cover radiation-, corrosion-, erosion-resistant and thermal coatings.

Prerequisite: MATH 175 and PHYS 231

SSE 399 - Selected Topics

(1 to 4 hrs.) In-depth guided study of topics that either go beyond regular course work or that are not regularly offered in the curriculum.

SSE 431 - Space Plasma Physics

(3-0-3) An introduction to plasma physics and its applications to space and astrophysical systems, with an emphasis on the Earth's environment in space. Topics will include the motion of charged particles in electromagnetic fields, the description of plasmas in the framework of one- and two-fluid approach, and its description in the framework of kinetic theory. Plasma equilibria, waves, and instabilities will also be discussed.

Prerequisite: PHYS 232

SSE 439 - Cooperative Education II

(1-6 hrs.) Petition required. Participation in supervised work experience in a professional environment.

Prerequisite: SSE 339

SSE 442 - RF/Microwave Systems & Antennas

(2-2-3) RF/Microwave systems and antennas design, analysis, fabrication, test and characterization. Transmission lines in general, introduction to waveguides, planar transmission lines, concept of impedance matching for optimum power transfer, measurement methods for transmission lines, introduction of S-parameters. Antennas in general, printed antennas, reflector antennas, fabrication techniques for printed antennas, impedance and radiation measurements for antennas. Microwave components used in systems such as filters, isolators, directional couplers and power splitters will also be covered.

Prerequisites: PHYS 232, PHYS 232A, MATH 275, and PHYS 211/211L

Corequisite: SSE 442L

SSE 444 - Satellite Communications

(2-2-3) The course covers fundamental concepts of satellite communications including satellite link modulation schemes, error-correction techniques, and spacecraft and ground station hardware and instrumentation. Equates with EEC 444.

Prerequisite: SSE 442

Corequisite: SSE 444L

SSE 445 - Space Systems Communications Laboratory

(0-2-1) Petition required. This laboratory course complements SSE 444/EEC 444 that covers fundamental concepts of satellite communications including satellite link modulation schemes, error-correction techniques, and spacecraft and ground station hardware and instrumentation. Students will participate in investigations in waveform properties, modulation schemes, antenna characteristics, antenna measurements, noise figures and communications link budgets.

Prerequisite: SSE 442

Corequisites: SSE 444 and SSE 444L

SSE 460 - Spacecraft Sensors and Remote Sensing

(3-0-3) Students will investigate the technologies involved in monitoring Earth systems from space platforms and in measuring spacecraft environment parameters critical to the health and safety of a spacecraft. In addition to the environment, gathering information from other sensors is the primary function of most satellite missions. Students will investigate the parameters and considerations involved in sensors for specific applications. Remote sensing techniques associated with multispectral imaging, RADAR, and LiDAR will be investigated.

Prerequisite: 1. SSE 122 and 2. PHYS 202 or PHYS 232

SSE 464 - Astrodynamics

(3-0-3) This course will help students to understand orbits and satellite motions, ranging from the two-body problem to interplanetary missions.

Prerequisite: PHYS 231

SSE 475 - Rocket Propulsion

(3-0-3) This course will help students understand thermochemistry, propulsive parameters, liquid and solid rocket engines. Furthermore, it will provide a general overview regarding electric and satellite propulsion.

Prerequisite: PHYS 231

SSE 476 - Directed Research

(1 to 6 hrs.) Participation in a research project under faculty guidance.

SSE 498 - Senior Design Project I

(2-0-2) A directed research project will be designed, data will be collected and analyzed, in consultation with a faculty advisor. A primary literature search and research proposal will be completed using library facilities and current technology. This research project will culminate with a scientific paper and oral presentation in SSE 499C.

Prerequisite: SSE 360

SSE 499C - Senior Design Project II

(3-0-3) Completion of the directed research project begun in SSE 498. A formal report that includes the basic literature search and appropriate experimental work will be prepared in a form suitable for submission to a scientific journal. A scientific oral presentation of the research will be made to the faculty. In addition, an oral presentation at a state, regional, or national scientific meeting will be encouraged. This course satisfies the integrative component for general education.

Prerequisite: SSE 498

Curriculum Map – Space Systems Engineering –2019-2020

NOTE: If you are required to complete any developmental courses, you may not be able to complete the degree in four years. This curriculum map assumes that you have not transferred in any previously completed college level courses.

FIRST YEAR COURSE SCHEDULE							
✓	Fall Semester	Code	Credits	✓	Spring Semester	Code	Credits
	SSE 105/L – Intro to Electronic Processes	R	3		SSE 120/L – Satellites & Space Systems I	R	3
	FYS 101 - First Year Seminar	G	3		MATH 175 – Calculus I	G	4
	ENG 100 – Writing I	G	3		ENG 200 – Writing II	G	3
	NSC 2 –ASTR 125 (Exchange)	G	3		HUM 2 – Humanities Elective	G	3
	CHEM 111/L Princ of Chem I	R	4		COMS 108 – Fundamentals of Speech	G	3
Total Credit Hours			16	Total Credit Hours			16

SECOND YEAR COURSE SCHEDULE							
✓	Fall Semester	Code	Credits	✓	Spring Semester	Code	Credits
	SSE 122/L – Satellites & Space Systems II	R	3		SSE 210/L – Spacecraft Mechanical Systems	R	3
	MATH 275 – Calculus II	S	4		PHYS 232 – Engineering Physics II	S	4
	PHYS 231 – Engineering Physics I	S	4		PHYS 232A – Engineering Physics II Lab	S	1
	PHYS 231A – Engineering Physics I Lab	S	1		SBS 1 – Social/Behavioral Sci Elective	G	3
	NSC –1 Life Sciences Elect	G	3		SBS 2 – Social/Behavioral Sci Elective	G	3
	HUM 1 – Humanities Elect	G	3				
Total Credit Hours			18	Total Credit Hours			14

THIRD YEAR COURSE SCHEDULE							
✓	Fall Semester	Code	Credits	✓	Spring Semester	Code	Credits
	PHYS 211/L – Linear Circuits	R	4		SSE 320/L – Spacecraft Electronics Systems	R,U	3
	SSE 340/L – Digital Control Systems for Space	R,U	4		SSE 360 – Advanced Space Systems	R,U	3
	ETM 307/L – Materials Science	R, U	3		SSE 370 – Flight Software Systems	R,U	3
	MATH 376 – Calculus III	S	4		SSE 464 - Astrodynamics	R,U	3
	MATH 312 – Numerical Methods	S,U	3				
Total Credit Hours			18	Total Credit Hours			12

FOURTH YEAR COURSE SCHEDULE							
✓	Fall Semester	Code	Credits	✓	Spring Semester	Code	Credits
	SSE 324 – Radio Astronomy	R,U	3		SSE 431 – Space Plasma Physics	R,U	3
	SSE 442/L – RF/Microwave Systems & Antennas	R,U	3		SSE 444/L – Satellite Communications	R,U	3
	SSE 498 – Senior Design Project I	R,U	2		SSE 445 – Space Systems Communications Lab	R,U	1

EEC 400/L – Digital Signal Processing	R,U	3	SSE 475 – Rocket Propulsion	R,U	3
Technical Elective		2	SSE 499c – Senior Design Project II	G,U	3
Total Credit Hours		13	Total Credit Hours		13

Codes (G) General Education Course (E) Elective
(R) Required Course (S) Supplemental
(U) Upper Division Course 300-400 level (you must have 42 hours)
(P) Pre-Requisite Course(s) must be successfully passed to be eligible to enroll in this course.

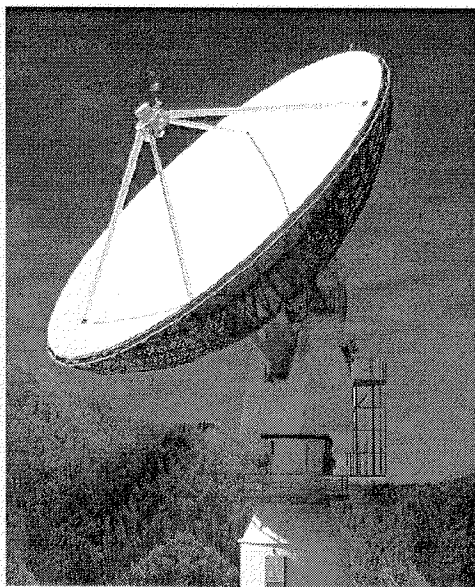
Abbreviations: F, P: Full-time or Part-time; D, UN, UT, G: Developmental, Undergraduate Nontransferable, Undergraduate Transferat School Dual Enrollment Course



MOREHEAD STATE UNIVERSITY

Ronald G. Esdlin

Space Science Center

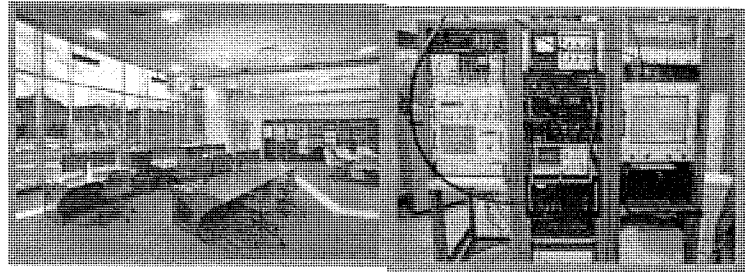


Morehead State University Space Science Center
 21 Meter Space Tracking Antenna
 (Latitude: 38° 11 30.773 N,
 Longitude: 83° 26 19.948 W) U.S.A

FUNCTION	PERFORMANCE
Antenna Diameter	21 Meter
Receive Polarization	RHCP, LHCP, VERT, HORZ
Travel Range	AZ +/- 275 degrees from due South (180 deg) EL -1 to 91 degrees POL +/- 90 degrees
Velocity	AZ Axis = 3 deg/sec EL Axis = 3 deg/sec POL Axis = 1 deg/sec
Acceleration	AZ = 1.0 deg/sec/sec min EL = 0.5 deg/sec/sec min
Display Resolution	AZ/EL = 0.001 deg POL = 0.01 deg
Encoder Resolution	AZ/EL = 0.0003 deg (20 Bit)
Tracking Accuracy	<= 5% Received 3 dB Beamwidth (0.028 deg RMS L-band) (0.005 deg RMS Ku-Band)
Pointing Accuracy	<= 0.01 deg rms

21 M Space Tracking Antenna

The Space Science Center at **Morehead State University** has developed a full motion 21-meter class antenna system which is engaged in a rigorous research program in radio astronomy and also serves as an Earth Station for satellite mission support as well as a test bed for advanced RF systems. The instrument is staffed by university faculty and students and is available for a wide variety of TT&C services. Performance Characteristics are provided below:



21 M Mission Operations Center

Control Room at 21 M

21 M Antenna System Radio Frequency Operating Regimes

Radio Frequency (RF) Band	Bandwidth	
	Low End	High End
L-Band	1.4 GHz	1.7 GHz
S-Band	2.2 GHz	2.7 GHz
X-Band	7.0 GHz	8.5 GHz
Low C-Band	4.8 GHz	5.0 GHz
Ku-Band	11.2 GHz	12.7 GHz

Radio Frequency Performance at L-Band and Ku-Band

Radio Frequency (RF) Performance Criterion	Measured Parameters	
	L-Band	Ku-Band
Frequency	1.40 GHz	11.2 GHz
Antenna Gain	47.80 dBi	65.50 dBi
LNA Temperature	25 K	70 K
System Temperature, T_{sys}	83.8 K	139.0 K
G/T at 5° Elevation	28.6 dBi/K	44.1 dBi/K
HPBW	0.62 °	0.08 °

Radio Frequency Performance at S-Band and X-Band

Radio Frequency (RF) Performance Criterion	Performance Measures	
	S-Band	X-Band
Frequency	2.2-2.7 GHz	7.0-8.5 GHz
Antenna Gain	52.8 dBi	62.7 dBi
System Temperature, T_{sys}	215K	<100K
LNA Temp	85K	<20K
G/T at 5° Elevation	29.5dBi/K	40.4 dBi/K
HPBW	0.37 °	0.115 °

For Scheduling or Cost Structure contact:

Dr. Ben Malphrus (606) 783-2212 b.malphrus@moreheadstate.edu

MOREHEAD STATE UNIVERSITY

Space Environmental Testing Services

Morehead State University's Spacecraft Environmental Testing Laboratory (SETL), located within the Space Science Center, offers testing and qualification services for spacecraft up to 100-kg. The SETL is capable of supporting Hardware in the Loop (HWIL) testing to NASA GEVS level and greater. The SETL has a rich heritage of testing and qualifying in-house built satellites and is available as a commercial service for both public and private sectors.

SVL FACILITIES INCLUDE:

- Class 10,000/100,000 Clean Room
- Vibration Analysis System
- Thermal Vacuum System
- Residual Gas Analysis (RGA) System
- Anechoic Chamber
- Copper Screen Room
- Helmholtz Coil
- Solar Flux Simulator



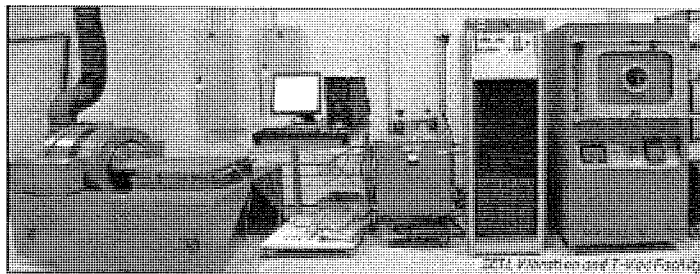
SPACE ENVIRONMENTAL TESTING

EMI/EMC TESTING

Complete EMI/EMC Testing to MIL-STD-461C: Electromagnetic Emission and Susceptible Requirements for the Control of Electromagnetic Interference.

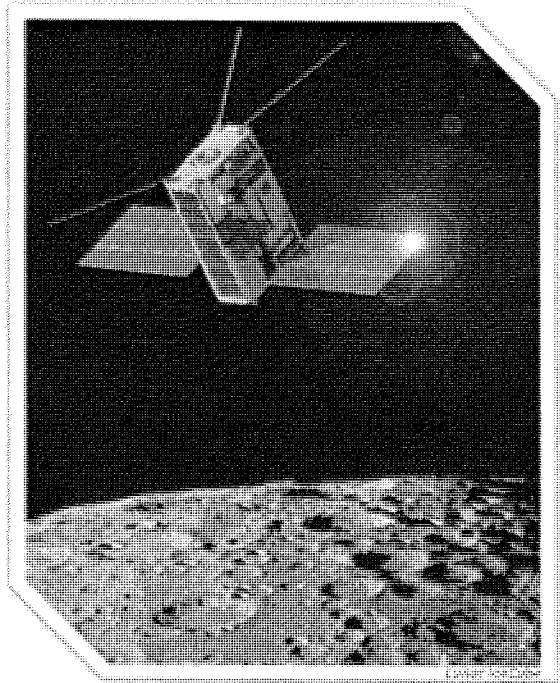
VIBRATION TESTING

Vibration testing verifies satellite survivability post launch and can identify mechanical and structural faults and stresses. The SETL's vibration slip table allows for 3-axes of testing at or above NASA GEVS levels and can be customized per mission ICD.



THERMAL VACUUM TESTING

Thermal vacuum (T-Vac) testing verifies satellite performance in a simulated space environment with temperature extremes beyond that which the satellite is expected to experience on orbit. The SETL's T-Vac system has a capacity of 0.29 m³ (10 ft³) and a temperature range of -100°C to +220°C at 1x10⁻⁸ torr. Pass throughs allow for functional testing under vacuum.



ANTENNA CHARACTERIZATION

The SETL's anechoic chamber and copper screen room facilitates empirical measurements of antenna parameters such as radiation patterns, gain, system temperature profiles, astronomical radio source gain-to-noise temperature ratio (G/T), cross-polarization isolation contours, and effective isotropically radiated power (EIRP) stability.



For more information and pricing, please contact:

Dr. Benjamin Malphrus
Executive Director, Space Science Center
(606) 783-2212
b.malphrus@moreheadstate.edu



Morehead State University Space Science Center
235 Martindale Drive • Morehead, Kentucky 40351
Phone 606-783-2381 • www.moreheadstate.edu/ssc

Space Environmental Testing Services

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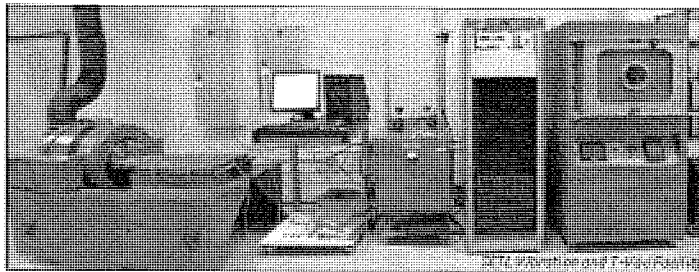
M SPACE ENVIRONMENTAL TESTING

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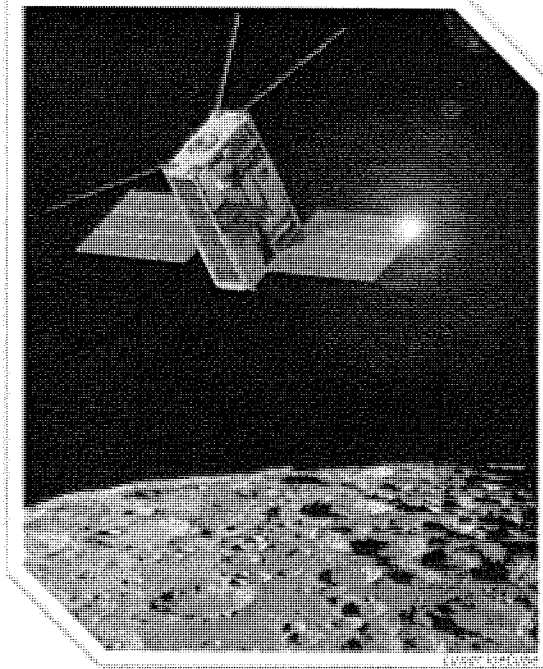
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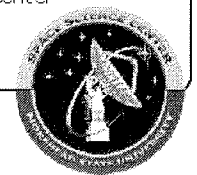


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Faculty Roster Form
Qualifications of Full-Time and Part-Time Faculty

Name of Institution: Morehead State University

Name of Primary Department, Academic Program, or Discipline: Earth and Space Sciences; B.S. in Space Systems Engineering Academic Term(s)

Included: Courses to be taught Date Form Completed: 11/15/2018

1 NAME (F, P)	2 COURSES TAUGHT Including Term, Course Number & Title, Credit Hours (D, UN, UT, G) [Dual] Note – for substantive change prospectuses/applications, list the courses to be taught, not historical teaching assignments	3 ACADEMIC DEGREES & COURSEWORK Relevant to Courses Taught, Including Institution & Major List specific graduate coursework, if needed	4 OTHER QUALIFICATIONS & COMMENTS Related to Courses Taught
Brown, Kevin Z. (P)	SSE 340 Digital Control Systems for Space, 4 (UN) SSE 360 Advanced Space Systems, 3 (UN) SSE 475 Rocket Propulsion, 3 (UN)	M.S. Mechanical Engineering, Kansas State University B.S. Mechanical Engineering, Kansas State University	See attached Exceptional Expertise memo
Combs, Michael S. (P)	SSE 105 Introduction to Electronic Processes, 3 (UN) SSE 210 Spacecraft Mechanical Systems, 3 (UN)	M.S. Vocational Education, Morehead State University B.S. Industrial Education, Morehead State University	42 graduate credit hours in industrial education. SSE 210 is a Computer Assisted Design course.
Conner, Charles D. (P)	SSE 340 Digital Control Systems for Space, 4 (UN) SSE 360 Advanced Space Systems, 3 (UN) SSE 370 Flight Software Systems, 3 (UN) EEC 400 Digital Signal Processing, 3 (UN)	Ph.D Electrical Engineering, Catholic University of America M.S. Electrical Engineering, University of Maryland, College Park B.S. Electrical Engineering, University of Maryland, College Park	
Garcia, Jose L. (P)	SSE 120 Satellites and Space Systems I, 3 (UN) SSE 122 Satellites and Space Ssystems II, 3 (UN) SSE 320 Spacecraft Electronics Systems, 3 (UN)	M.S. Electrical Engineering, National Autonomous University of Mexico M.S. Space Systems Engineering, Morehead State University B.S. Mechanical and Electronics Engineering, National Autonomous University of Mexico	See attached Exceptional Expertise memo

Abbreviations: F, P: Full-time or Part-time; D, UN, UT, G: Developmental, Undergraduate Nontransferable, Undergraduate Transferable, Graduate; Dual: High School Dual Enrollment Course

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Grupe, Dirk (F)	ASTR 403 Astrophysical Instrumentation and Payloads, 3 (UN) ASTR 460 High Energy Astrophysics, 3 (UN) ASTR 464 Astrodynamic, 3 (UN)	D.S. Astrophysics, George-August-Universität Göttingen (Germany) M.S. Astrophysics, George-August-Universität Göttingen (Germany)	
Jerde, Eric A. (F)	ESS 303 Planetary Geology, 3 (UN)	Ph.D. Geology (Geochemistry), University of California, Los Angeles M.S. Geology, Washington State University B.A. Physics/Earth Science, St. Cloud State University	
Kruth, Jeffrey A. (P)	PHYS 211 Circuits, 4 (UN) SSE 442 RF/Microwave Systems and Antennas, 3 (UN) SSE 444 Satellite Communications, 3 (UN) SSE 445 Space Systems Communications Lab, 1 (UN) SSE 498 Senior Design Project I, 2 (UN) SSE 499c Senior Design Project II, 3 (UN)	M.S.E.E. (ABD) Electrophysics, George Washington University B.S.E.E. Electrical Engineering, University of Pittsburgh	See attached Exceptional Expertise memo
Pannuti, Thomas G. (F)	SSE 324 Radio Astronomy, 3 (UN) SSE 431 Space Plasma Physics, 3 (UN)	Ph.D. Physics, University of New Mexico M.S. Physics, University of New Mexico B.S. Physics, Rensselaer Polytechnic Institute	

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MOREHEAD STATE UNIVERSITY SPACE SCIENCE CENTER

235 MARTINDALE
DRIVE MOREHEAD,
KY 40351
TEL: 606 783-2381

MEMORANDUM

DATE: 27 March 2018

TO: Dr. Wayne Miller, Dean
College of Science

Dr. Eric A. Jerde, Interim Chair Department of
Earth and Space Sciences

RE: Exceptional Expertise - Kevin Brown

Kevin trained as a professional engineer beginning with his BS in Mechanical Engineering degree in 2002, leading to his Master of Science in Mechanical Engineering completed in 2004 (both from Kansas State University) and most recently culminating in a Certificate of Spacecraft Design from Stanford University in 2007. He was one of Bob Twiggs' top graduate students at Stanford and Professor Twiggs played an important role in recruiting Kevin for a position of Assistant Professor of Space Science.

After his undergraduate and graduate training, Kevin spent 9 years as a professional engineer. His engineering career began as Guidance and Controls Systems Engineer at Geneva Aerospace (L-3), Carrollton, TX. In that position he performed UAV airframe characterization, stability coefficient analysis and generation, mass properties, and propulsion performance estimation. He wrote executive program in C++ for Monte Carlo analysis management of Matlab/Simulink simulation and analyzed and compensated for INS/Kalman filter GPS measurement latencies in navigation system. Additionally he derived geodetic INS system error equations for navigation systems. From 2004-2009 he served as Senior Software Engineer at Lockheed Martin Space Systems Co., in Sunnyvale CA in their Navigation, Guidance, and Control Group. There he was awarded DOD Clearance and worked on the Falcon Hypervelocity Vehicle and Trident II D5 Missile programs. In 2009 Kevin co-founded Astronautical Development, LLC in Los Angeles CA and served as its originating Director of Engineering. In that capacity he managed engineering processes, policies, procedures and personnel along with integrity of technical design and analysis. For AstroDev he managed and executed US Government contracts developing Cubesat class satellite communications

systems. He proposed, won, and executed over \$500k of US Government development contracts in FY09. He was responsible for new business proposal content and representation of company in industry technical organizations. He fostered partnerships with industry partners through joint proposals and engineering efforts and a relationship with Boeing Space Systems resulting in development and delivery of Colony 2 Cubesat spacecraft radios in 2010. For AstroDev he provided knowledge of systems engineering competencies such as requirements management and system

optimization to contract activities and trained employees. He trained personnel in electrical engineering design and analysis tools within areas of PCB design and RF modeling and managed company operations such as component suppliers, inventory, and manufacturers.

These experiences represent a significant body of work in the aerospace and defense electronics industries and are particularly relevant to the design projects that students in our MSSE program will undertake. These experiences also prepare him well for teaching specific courses related to these technologies in the MSSE program (SSE 640 Advanced Processor Systems for Space Applications, and SSE 650 Spacecraft Design and Fabrication).

Mr. Brown has begun to develop a history of professional activities in the aerospace and defense systems engineering disciplines. These include numerous presentations, co-authoring several publications, and serving as co-PI on numerous grant and contract projects and as the lead engineer on some of the Space Science Center's most important nanosatellite projects-- the Cosmic X-Ray Background Nanosatellite (both 1 and 2), and the Lunar IceCube. The presentations and publications are on various aspects of nanosatellite systems and satellite ground station instrumentation -- precisely the technologies that the MSSE will train student engineers in.

From 2010-2012 Kevin served as the lead engineer on CXBN, and from 2014 till the present he has been the lead engineer on CXBN-2, due to launch in late December, 2016.

Kevin has managed the Morehead efforts on these programs and has done an outstanding job to date. His tech demos (held at Morehead) have been extremely successful and positioned us well for a Phase II contracts on the CXBN spacecrafts, and also demonstrated the capabilities that permitted the Space Science Center to win primary contract status on the Lunar IceCube spacecraft, due to launch to the Moon in late 2018. The potential benefits of this R&D in an emerging technology that is vital to national defense and the U.S. economy, which is intricately tied to space, cannot be understated. The benefits to the Space Science Center, the College of Science and Technology, Morehead State University, and eastern Kentucky are indeed significant.

In addition to these accomplishments, Kevin holds one patent and has been responsible for several invention disclosures, including one for an innovative Cubesat power system that he is currently working on at Morehead State. These accomplishments are both significant and relevant to the work we will undertake with students in the MSSE program.



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MEMORANDUM

DATE: 27 March 2018

TO: Dr. Wayne Miller, Dean
College of Science

FROM: Dr. Eric A. Jerde, Interim Chair
Department of Earth and Space Sciences

RE: Exceptional Expertise – Jose Garcia

Jose Garcia has many years of experience in engineering and has contributed to the discipline in many ways. Some important achievements made by Jose include: A pioneer of the development of small satellites in Mexico, promotion of the Mexican Space Agency, development of applications for small satellites, development of communication systems for social development, promoter and diffuser of space technology and space science, promoter of the use of sustainable technologies (solar, wind), and participation in the implementation of a new satellite system (MEXSAT) for the Mexican Government. These achievements, among others has resulted in Jose being made a member of the Mexican Academy of Engineering.

Jose Garcia, received at the Plesetsk Cosmodrome (Russia) the honorific title of “Space Engineer” because of the successful launch of the first satellite made fully in Mexico by Mexicans, the UNAMSAT-B, a scientific satellite made at the National Autonomous University of Mexico (UNAM). In addition, Jose has been recognized for his participation in several space projects internationally with institutions such as Stanford University, the Moscow Aviation Institute, Swedish Institute of Space Physics, CANEUS International as well as several Mexican Academic and Government Institutions.

Jose Luis Garcia has taught several classes related to Space Technology and Satellite Development. The experience teaching such courses led Jose to develop several tools for use in his classes. One such tool is the Mini-CanSat, a small and scalable device that facilitates an understanding of how various satellite subsystems work. When used in concert with a small ground station, the students gain experience in the reception of the Mini-Cansat signals as well as sending commands to it. This extraordinary tool has been developed extensively, as it has been used among students from elementary school to college-level. In October, 2016, this learning tool was presented on the 2nd Annual College of Business and Technology “Business Pitch Competition”, where it received numerous accolades.

Jose Luis Garcia is co-author of a book and peer-reviewed papers as well as other publications in different media, including that intended for public consumption. Three papers and the book are listed below:

Papers

1999, “The diameter distribution of Earth-crossing asteroids”, *Planetary and Space Science* 47, 679-685.

1999, “The expected frequency of collisions of small meteorites with cars and aircraft”, *Planetary and Space Science* 47, 715-719.

2003 “Mexican Satellites UNAMSAT, a Space Experience“, Latino American Space Association publication.

Book

2015, “Satellite Communications” (with Rodolfo Neri Vela). ISBN 978-607-502-371-7



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MEMORANDUM

DATE: 27 March 2018

TO: Dr. Wayne Miller, Dean
College of Science

FROM: Dr. Eric A. Jerde, Interim Chair
Department of Earth and Space Sciences

RE: Exceptional Expertise – Jeff Kruth

Jeff trained as a professional engineer beginning with his Electrical Engineering degree in 1978 (University of Pittsburgh) and completing all of the coursework (33 graduate credit hours) for a MS in Electrophysics at George Washington University. Jeff completed all of the coursework for his masters program but took a job at Westinghouse before completing the thesis. During 5 years of work at Westinghouse he served as a senior engineer in a variety of divisions including, the Aerospace Division, Electronic Warfare Engineering, Systems Development, and Microwave Systems Engineering. He served as a professional engineer for a number of other companies including Defense Systems Concepts and serving in the Advanced Systems Development Division, Electronic Warfare Engineering Department of Gould Inc.

Jeff has worked as a professional engineer for large aerospace companies (Westinghouse) and small (Gould Inc.) and has successfully run a small R&D company (K-MEC) for 27 years. As the CEO and chief engineer of K-MEC, Jeff has won a number of government contracts for defense related research. A few of the most significant ones include "Non Contact Ranging" which was a MMW radar development contract, and "Integrated HF-VHF Power Circuits", an amplifier development effort. K-MEC has supported expendable electronic countermeasures (ECM) development efforts for the Naval Air Warfare Center, Warminster PA. K-MEC designed and built a fifty channel acousto-optic backend processor for an advanced sonar signal processor (Northrop-Grumman/Signal Corp.). Another design and development effort was the IR signal processor for the Battlefield Anti-Tank (BAT) missile (Northrop-Grumman). Jeff served as the lead engineer on all of these projects.

Additionally, Jeff designed the first radio astronomy receiver for the Morehead State University 13 Meter Radio Telescope and has designed and built all of the complex receiver systems for the highly successful 21 M Space Tracking Antenna currently operated by the Space Science Center.

Research with both of these instruments led to a significant portfolio of undergraduate and graduate student presentations and publications in a variety of disciplines including radio astronomy, space mission operations, electrical and controls engineering, mechanical systems engineering and radio frequency and microwave engineering. Just this past year, the 21 M Antenna has been selected for addition to NASA's Deep Space Network (DSN) as an asset for communication with the array of interplanetary spacecraft in the solar system. The 21 M Antenna is the first non-NASA asset ever added to the DSN in its 60+ year history. To integrate the Antenna into the DSN, initial estimates of the cost were \$1.3 million. Jeff redesigned the receiver, resulting in an estimated savings of approximately \$1 million.

These experiences represent a significant body of work in the aerospace and defense electronics industries and are particularly relevant to the design projects that students in our MSSE program will undertake. These experiences also prepare him well for teaching specific courses related to these technologies in the MSSE program (SSE 644 Advanced Space Communication Systems, SSE 660 Spacecraft Sensors and Remote Sensing).

Jeff has a significant history of professional activities in the aerospace and defense systems engineering disciplines. These include numerous presentations, co-authoring 11 publications, and serving as co-PI on numerous grant and contract projects and as the lead engineer on one of the Space Science Center's most important (and lucrative) government contracts. The presentations and publications are on various aspects of nanosatellite systems, satellite ground station instrumentation, and radio astronomy instrumentation-- precisely the technologies that the MSSE will train student engineers in.

From 2010-2012 Jeff served as the lead engineer on TechSat-1, a nanosatellite project funded by the US Space and Missile Defense Command, which represents one of the Space Science Center's largest projects to date (Phase I was \$620,00 and Phase II was \$329,000 with Phase III pending). The program objectives include increasing the power available on CubeSat-like platforms and demonstrating the technology necessary to develop nanosats with significant and consistent power to operate high-capacity payloads. We successfully passed the Space Experiments Review Board in November of 2010, a major milestone that guarantees a flight opportunity for this satellite program. Major milestones in 2011 include successfully completing the preliminary design review and a technical demonstration of Phase I technologies. Milestones in Phase II included passing the critical design review and a tech demo that represented an engineering model of the satellite. Jeff managed the Morehead effort on this program and has done an outstanding job to date. The tech demo (held at Morehead in September 2012) was extremely successful and positioned us well for a Phase II contract. The potential benefits of this R&D in an emerging technology that is vital to national defense and the U.S. economy, which is intricately tied to space, cannot be understated. The benefits to the Space Science Center, the College of Science and Technology, Morehead State University, and eastern Kentucky are indeed significant.

In 2013, Jeff organized and conducted a meeting of the American Radio Relay League's "Microwave Update" Conference. It was held here at the Space Science Center and had approximately 100 attendees. The American Radio Relay League (www.arrl.org) is the national organization of amateur radio operators and enthusiasts.

An interesting point about Jeff's past experiences and related professional activities is that he was

contracted as the lead engineer and ultimately designed and built the first satellite communication systems for SpaceQuest-- a DC area company that produced some of the first viable microsatellites in the 1980s and today represents in many ways the standard for commercial microsatellites. In a way Jeff's career has come full circle-- developing microsatellite communication systems for one of the first companies involved in small satellites and now developing communications systems (and other systems) for Morehead State University's micro and nanosatellite program.

In addition to these accomplishments, Jeff holds one patent and has been responsible for several invention disclosures, including one for an innovative 60 GHz radar system for nanosatellite constellation ranging and interspacecraft communications that he is currently working on at Morehead State. These accomplishments are both significant and relevant to the work we will undertake with students in the MSSE program.