FINAL FACULTY SENATE APPROVAL ON APRIL 10, 2018

MEMORANDUM

TO: Faculty Senate

FROM: Jack Kirby JRK

DATE: March 27, 2018

SUBJECT: Curriculum Proposal #17-18-25 REV #1

Minor in Automation and Robotics

I recommend approval of the attached Curriculum Proposal 17-18-25 REV #1. This new minor is being offered for talented students in Mechanical Engineering Technology, Electrical Engineering Technology, and Computer Science. There is a growing need for engineers who can design, implement, and troubleshoot automation systems in manufacturing facilities. Computer control and monitoring of the manufacturing process will only increase as companies try to deliver higher quality products. This new minor will create opportunities for our graduates and help to build an educated workforce in WV. It might also help make this area more attractive to prospective high-tech companies looking to establish themselves in WV.

Dr. Christina Lavorata
Dr. Donald Trisel
Mr. Hugh Costello
Mr. Thomas McLaughlin
Dr. Mahmood Hossain
Mr. Michael Waide
Ms. Laura Ransom
Ms. Cheri Gonzalez
Ms. Lori Schoonmaker

FAIRMONT STATE UNIVERSITY

MEMORANDUM

TO: Curriculum Committee

FROM: Jack Kirby

DATE: March 23, 2018

SUBJECT: Curriculum Proposal #17-18-25 REV #1

Minor in Automation and Robotics

I recommend approval of the attached Curriculum Proposal 17-18-25 REV #1. This new minor is being offered for talented students in Mechanical Engineering Technology, Electrical Engineering Technology, and Computer Science. There is a growing need for engineers who can design, implement, and troubleshoot automation systems in manufacturing facilities. Computer control and monitoring of the manufacturing process will only increase as companies try to deliver higher quality products. This new minor will create opportunities for our graduates and help to build an educated workforce in WV. It might also help make this area more attractive to prospective high-tech companies looking to establish themselves in WV.

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FAIRMONT STATE UNIVERSITY

MEMORANDUM

TO: Curriculum Committee

FROM: Jack Kirby

DATE: March 16, 2018

SUBJECT: Curriculum Proposal #17-18-25

Minor in Automation and Robotics

I recommend approval of the attached Curriculum Proposal 17-18-25. This new minor is being offered for talented students in Mechanical Engineering Technology, Electrical Engineering Technology, and Computer Science. There is a growing need for engineers who can design, implement, and troubleshoot automation systems in manufacturing facilities. Computer control and monitoring of the manufacturing process will only increase as companies try to deliver higher quality products. This new minor will create opportunities for our graduates and help to build an educated workforce in WV. It might also help make this area more attractive to prospective high-tech companies looking to establish themselves in WV.

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Curriculum Proposal for a Minor in Automation and Robotics

Proposal Number:	#17-18-25 Minor in Automation and Robotics
School/Department/Program:	Science and Technology/Engineering Technology
Preparer/Contact Person:	Hugh Costello / Thomas McLaughlin / Mahmood Hossain
Telephone Extension:	x4821 / x4915 / x4967
Date Originally Submitted:	March 16, 2018
Revision (Indicate date and label it Revision #1, #2, etc.):	03/23/2018 Revision #1
Implementation Date Requested:	Fall 2018

I. **PROPOSAL.** Write a brief abstract, not exceeding 100 words, which describes the overall content of the proposal.

This new minor is being offered for talented students in Mechanical Engineering Technology, Electrical Engineering Technology, and Computer Science. There is a growing need for engineers who can design, implement, and troubleshoot automation systems in manufacturing facilities. Computer control and monitoring of the manufacturing process will only increase as companies try to deliver higher quality products. This new minor will create opportunities for our graduates and help to build an educated workforce in WV. It might also help make this area more attractive to prospective high-tech companies looking to establish themselves in WV.

II. **DESCRIPTION OF THE PROPOSAL.** Provide a response for each letter, A-H, and for each Roman Numeral II–V. If any section does not apply to your proposal, reply N/A.

A. Deletion of course(s) or credit(s) from program(s)

N/A

Total hours deleted. _____

B. Addition of course(s) or credit(s) from program(s)

N/A

Total hours added. _____

C. Provision for interchangeable use of course(s) with program(s)

N/A

D. Revision of course content. Include, as an appendix, a revised course description, written in complete sentences, suitable for use in the university catalog.

N/A

E. Other changes to existing courses such as changes to title, course number, and elective or required status.

N/A

F. Creation of new course(s). For each new course

1. Designate the course number, title, units of credit, prerequisites (if any), ownership (FSU or shared) and specify its status as an elective or required course. If you are creating a shared course, attach a memo from the Deans of the affected Schools explaining the rationale for the course being shared.

   TECH 4450 Automation and Robotics, FSU course, 3 Hours, Required

2. Include, as an appendix, a course description, written in complete sentences, suitable for use in the college catalog.

   See Appendix A

3. Include, as an appendix, a detailed course outline consisting of at least two levels.

   See Appendix A

4. In order to meet the requirements as outlined in Goal One of the Strategic Plan, please include Outcome Competencies and Methods of Assessment as an appendix. Examples are available upon request from the Chair of the Curriculum Committee.

   See Appendix A

G. Attach an itemized summary of the present program(s) affected, if any, and of the proposed change(s).

   Describe how this proposal affects the hours needed to complete this program. Specifically, what is the net gain or loss in hours? Use the format for Current and Proposed Programs in Appendix A.

   N/A

III. RATIONALE FOR THE PROPOSAL

A. **Quantitative Assessment**: Indicate the types of assessment data, i.e., surveys, interviews, capstone courses, projects, licensure exams, nationally-normed tests, locally developed measurements, accreditation reports, etc., that were collected and analyzed to determine that curricular changes were warranted. Quantitative data is preferred.

Any manufacturing facility with products flowing through a line will need to hire someone with experience in Automation and Robotics. We have students working at Mylan's facilities processing and packaging pharmaceuticals. We have students working in Hitachi's automotive facilities that have a great deal of automation to produce components such as power steering units. These former students and their employers have communicated with us their desire to hire graduates with these skills. Any facility with moving machinery that must be controlled through computers or programmable logic controllers integrated with sensors. There is also a safety factor to consider. Often automated machines and robots live and work in areas and around chemicals and conditions that would be best avoided by people.

Fairmont State University hosts several state, regional, and national robotics competitions throughout the year. Each of these events brings hundreds of students to the FSU campus. These students are interested in opportunities to continue their work with robotics after high school. They have expressed interest in joining robotics clubs in college and taking coursework related to automation and robotics. Todd Ensign, with the NASA ERC, is working to get robotics approved as a high school sport in WV. Fairmont State has been positioned very well to take advantage of this rising momentum and attract some of these energetic students to enroll at FSU. Having a minor ready for Fall 2018 may entice some of these students.

B. **Qualitative Assessment**: Based upon the assessment data above, indicate why a curricular change is justified. Indicate the expected results of the change. Be sure to include an estimate of the increased cost, or reduction in cost of implementation. FOR EXAMPLE: Will new faculty, facilities, equipment, or library materials be required?

We are providing new opportunities for students in three different majors: Mechanical, Electronics and Computer Science. Students majoring in one of these fields will take additional course work from the other two fields. One new capstone experience course, TECH 4450, will be added to the curriculum and every person in the minor will be required to take it.

Other than the staffing of this new course, we don't expect any additional faculty or facilities. Some new equipment is needed for this minor and for improvements in the Electronics major. The total cost is about $11,000. This equipment has already been ordered and is being paid from SciTech funds.

IV. Should this proposal affect any course or program in another school, a memo must be sent to the Dean of each school impacted and a copy of the memo(s) must be included with this proposal. In addition, the Deans of the affected schools must sign below to indicate their notification of this proposal.

By signing here, you are indicating your college's/school's notification of this proposal.

College/School	Dean	Signature
Science and Technology	Dr. Don Trisel	Don Trisel

The content of this proposal does not affect any course or program from another school/college.

V. Should this proposal affect any course to be added or deleted from the general studies requirements, a memo from the chair of the General Studies Committee indicating approval of the change must be included with this proposal.

N/A

VI. ADDITIONAL COMMENTS.

APPENDIX A

Minor in Automation and Robotics
Proposed Program Restricted to BSMET, BSEET, and BSCS Majors Only

Minor requirements for those pursuing a BS Degree in Mechanical Engineering Technology:

Required Major Courses		HRS
Minor Requirements/Electives (if minor is required)		24
COMP 1102*	Principles of Programming I	3
COMP 1108	Principles of Programming II	3
ELEC 1120	AC/DC Electronics Analysis	3
ELEC 2230	Digital Electronics	3
ELEC 2270	Microcomputers	3
ELEC 2280	Programmable Controllers	3
ELEC 4420	Advanced Automation Controller Systems	3
TECH 4450	Automation and Robotics	3
TOTAL HOURS FOR MAJOR (and minor if required)		**24**

* **COMP 1102 replaces the COMP 1101 requirement for the BS in MET**

Minor requirements for those pursuing a BS Degree in Electronics Engineering Technology:

Required Major Courses		HRS
Minor Requirements/Electives (if minor is required)		24
COMP 1102*	Principles of Programming I	3
COMP 1108	Principles of Programming II	3
COMP 2201	Machine Organization	3
MECH 1100	Statics	3
MECH 2200	Strength of Materials	3
MECH 2240	Machine Design	3
MECH 3320	Dynamics	3
TECH 4450	Automation and Robotics	3
TOTAL HOURS FOR MAJOR (and minor if required)		**24**

* **COMP 1102 replaces the pre-existing COMP 1101 requirement for the BS in MET**

Minor requirements for those pursuing a BS Degree in Computer Science:

Required Major Courses		HRS
Minor Requirements/Electives (if minor is required)		28-29
PHYS 1101 or PHYS 1105	Introduction to Physics I or Principles of Physics I	4-5
ELEC 1100	Circuit Analysis I	3
ELEC 2250	AC-DC Machinery and Controls	3
ELEC 2270	Microcomputers	3
ELEC 2280	Programmable Controllers	3
ELEC 4420	Advanced Automation Controller Systems	3
MECH 1100	Statics	3
MECH 3320	Dynamics	3
TECH 4450	Automation and Robotics	3
TOTAL HOURS FOR MAJOR (and minor if required)		28-29

Creation of New Course (Ref Section II.F)

(Ref. Section II.F.1 of Proposal) Course: **TECH 4450 Automation and Robotics 3 SEM. HRS.**
(Ref. Section II.F.2 of Proposal) Description
This course is designed to serve as a capstone study for qualified students earning the Automation and Robotics Minor. The course integrates the mechanical, electronic, and computer science fields into a study in automation and robotics applications. Automation, motion control, tele-robotic, and robotic solutions are applied to industrial systems. PR: ELEC 4420 and MECH 3320 and COMP 1108.

(Ref. Section II.F.3) Two-Level Outline

1. INTRODUCTION
   - 1.1 Automation
   - 1.2 Types of Systems
   - 1.3 Design Considerations
2. INDUSTRIAL AUTOMATION SYSTEMS
   - 2.1 Pneumatics
   - 2.2 Hydraulics
   - 2.3 Electrical
   - 2.4 Sensors
   - 2.5 Controllers
3. DESIGN FOR ASSEMBLY
   - 3.1 Part Design
   - 3.2 Assembly Design
4. DESIGN FOR MANUFACTURE
   - 4.1 Feeding Systems
   - 4.2 Tooling
   - 4.3 Process Control
5. INDUSTRIAL MOTION CONTROL
   - 5.1 Open Loop Control
   - 5.2 Closed Loop Control
   - 5.3 Computer and Controller Integration

6. ROBOTIC SYSTEMS
   - 6.1 Pick-and-Place and Conveyor systems
   - 6.2 Tele-Robotics
   - 6.3 Robots
7. SYSTEM INTEGRATION
   - 7.1 System Design
   - 7.2 System Control
   - 7.3 Specification

(Ref. Section II.F.4)

Course Outcomes and Assessments

Outcome:
By the end of this course a student will demonstrate the ability to design an automated system with specifications and control system needs defined. This will be accomplished through a group project developed during the semester.

Assessment:
A student group presentation and design report will be evaluated at the end of the semester using an established rubric.

Minor Program Outcomes and Assessment

The outcomes and assessments described for TECH 4450 will also serve as the outcomes and assessments for the Minor program described in this document. Because only one new course is being added to integrate three existing programs that are already satisfying assessment and accreditation standards, only the new course, TECH 4450, is needed for assessment of the program.