FAIRMONT STATE UNIVERSITY

MEMORANDUM

FINAL FACULTY SENATE APPROVAL ON 04/12/2016

TO: Faculty Senate

FROM: Jack Kirby

DATE: April 6, 2016

SUBJECT: Curriculum Proposal #15-16-14, REV #1

Electronics Engineering Technology

I recommend approval of the attached REVISION #1 Curriculum Proposal 15-16-14. This proposal attempts to better accommodate today's freshman students entering the electronics engineering field of study. The changes provide more freedom in choosing general studies electives, introduces new courses that more closely align with the needs of the industry, and better prepares graduates for today's job market.

Dr. Christina Lavorata
Dr. Donald Trisel
Dr. Thomas McLaughlin
Ms. Leslie Lovett
Ms. Cheri Gonzalez
Dr. Shayne Gervais

be First

FAIRMONT STATE UNIVERSITY

MEMORANDUM

TO: Curriculum Committee

FROM: Jack Kirby JKK

DATE: March 21, 2016

SUBJECT: Curriculum Proposal #15-16-14

Electronics Engineering Technology

I recommend approval of the attached Curriculum Proposal 15-16-14. This proposal attempts to better accommodate today's freshman students entering the electronics engineering field of study. The changes provide more freedom in choosing general studies electives, introduces new courses that more closely align with the needs of the industry, and better prepares graduates for today's job market.

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Proposal Number:	
School/Department/Program:	College of Science and Technology, Dept. of Technology, Electronics Engineering Technology (EET) Program
Preparer/Contact Person:	Thomas M. McLaughlin
Telephone Extension:	304.367.4915
Date Originally Submitted:	2/19/2016
Revision (Indicate date and label it Revision #1, #2, etc.):	
Implementation Date Requested:	Fall 2016

I. **PROPOSAL**. This proposal attempts to better accommodate today's freshman students entering the electronics engineering field of study. The changes herein provide more freedom in choosing general studies electives, and introduces new courses that more closely align with the needs of industry (as learned through the ABET Industry Advisory Council) and better prepares our graduates for today's job market.

A. Freshman students in the EET program will be required to take MATH 1101 (Applied Technical Mathematics 1) and MATH 1102 (Applied Technical Mathematics 2) during their Fall and Spring semesters respectively. This will provide a strong foundation in mathematics and problem solving. Students testing out of MATH 1101 and 1102 may select free and technical electives. Many students have been held back from taking entry level Electronic courses because of inadequate math placement scores. This approach allows the student to immediately enter the fundamental courses and follows a similar approach taken by the other FSU Engineering disciplines. Applied Calculus I (Math 1185) and Applied Calculus II (Math 1186) are still mandatory for the student testing out of Math 1101 to meet the general studies Quantitative Literacy requirements.

B. Instead of specifying a particular general studies course, the EET program strives to allow the student to determine the appropriate general study course according to their needs, interest, future goals, and course availability. Students can choose any course from the FSU offerings for the following general studies courses: Teamwork (ID), Ethics (IV), Arts (VIIA), Social Studies (VIIC), Interdisciplinary (VI), and Technology Literacy (IF).

C. The EET program is pleased to offer a new course based on feedback from our Industrial Advisory Committee (IAC) and by reviewing instruction provided from our competitors in this region. According to our IAC discussions, students should be knowledgeable to develop automation technology which includes Programmable Logic Controller (PLCs) Systems. Also, we understand that our closest competing ABET accredited institution does not offer this type of automation training. This provides a distinction for our program in the region. We recently purchased a new PLC system manufactured by Siemens and have begun to develop course work using this equipment. Our goal is to offer training whereby students will become certified by Siemens with PLC automation technology. The new class will be titled: ELEC 4420 Advanced Automation Controller Systems. We want to offer this course starting in the Fall Semester 2016.

D. Another new course will replace Shop Practices (ELEC 2200). ELEC 1120 AC/DC Electronics Analysis provides an organized approach to teaching a student to read a schematic diagram and to build, simulate, and troubleshoot various AC and DC circuits. This new course will lay the groundwork required for the more advanced courses and is designed to instill confidence in using the basic tools of an electronics engineer.

E. We propose to change the course number for the present ELEC 2260 Communication Systems to ELEC 3360. This change is necessary because of the advances in data communication technology and the level of mathematics and problem solving required in the course. It is appropriate to define this course as a 3000 series level course taken in the junior year by EET students.

F. The EET program will add General Chemistry to the course schedule (CHEM 1101). Our students graduating with a 4-year degree in engineering should have a thorough understanding of chemical principles. This will also bridge a gap in the instruction concerning the atomic and molecular structure of conductors, semi-conductors and insulators. Also, students need fundamental knowledge in this area if working in an environment involving chemical processing, controls and instrumentation.

G. This new model schedule prepares our two and four-year FSU students with strong skills in mathematics and problem solving, as well as broadening skills in the areas of science, engineering and high technology. Our objective is for an EET graduate from FSU to have the hands-on skills required by industry and a thorough background in theory and problem solving to compete in the changing work environment regionally and throughout the country.

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)
Courses listed below as required in Catalog Model Schedule 2015/16 includes:

ELEC 2200 Shop Practices	(3)
ELEC 2260 Communication Systems	(3)
TECH 1108 Engineering Graphics	(3)
SFTY 1100 Safety & Environmental Components of Industry	(3)
MATH 1113 Applied Statistics	(3)
ENGL 1109 Technical Report Writing	(3)
MANF 2250 Total Quality & SPC	(3)
MATH 1185 Applied Calculus I	(4)
MATH 1186 Applied Calculus II	(4)

Total hours deleted. 29

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

MATH 1101 Applied Technical Math I	(3)	
MATH 1102 Applied Technical Math II	(3)	
CHEM 1101 General Chemistry I	(4)	
TECH 2290 Engineering Analysis I	(4)	
TECH 3300 Engineering Analysis II	(4)	
Technology Literacy (Gen Studies Requirement)	(3)	
Teamwork (Gen Studies Requirement)	(3)	
Ethics (Gen Studies Requirement)	(3)	
ELEC 3360 Communication Systems	(3)	New Course Number
ELEC 1120 AC/DC Electronics Analysis	(3)	New FSU Course
ELEC 4420 Advanced Automation Controller Systems	(3)	New FSU Course

Total hours added. 36

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

D. Revision of course content. Include, as an appendix, a revised course description, written in complete sentences, suitable for use in the university catalog.
Old course->ELEC 2200 Shop Practices Name Change/ Content Update to focus on AC/DC Electronics & Simulation
New course-> ELEC 1120 AC/DC Electronics Analysis

E. Other changes to existing courses such as changes to title, course number, and elective or required status. Change the following course names:

From: ELEC 2270 Microcomputer Systems
To: ELEC 2270 Introduction to Microcontroller Systems

From: ELEC 3310 Advanced Microcomputer Systems
To: ELEC 3310 Advanced Microcontroller Systems

From: ELEC 2260 Communication Systems
To: ELEC 3360 Communication Systems

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.

Course number	Title,	Hrs	Pre-Requisites:	Ownership	Status
ELEC 1120	AC/DC Electronics Analysis	(3)	None	FSU	required
ELEC 4420	Advanced Automation Controller Systems	(3)	ELEC 2280	FSU	required

Refer to Appendix A for a comparison between the current Electronics Engineering Technology program and the proposed program.

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

Refer to Appendix B for course descriptions of the new courses in the proposed Electronic Engineering Technology program

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

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.

Refer to Appendix 4 for Outcome Competencies and Methods of Assessment for the new courses in the proposed Electronic Engineering Technology program

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.

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.

The preparer of this proposal conducted interviews with current upper- and lower-level students, members of the Industrial Advisory Committee (IAC), and the Chair of the Technology Department. Feedback from the IAC weighed heavily in our decisions. This data is documented in our IAC meetings notes dated November 6, 2015. Below is an excerpt from the IAC meeting minutes:
"*The EET program direction and vison was presented to the IAC members. The members were receptive to the steps currently being taken. It was communicated that the EET program has a vision to create a professional lab setting for our students. It was discussed that we lack the capability to develop our own*

printed circuit boards and we need to upgrade our equipment in the area of power, motor control, digital electronics, and automation. The current budget for these improvements is approximately $6000/year. Further, it was discussed that the priority for the program was to benefit the students. That a mainstay of the EET program would be built in the area of automation/human machine interface and that a recent purchase of equipment from Siemen's is our first step in that direction. Paul Deavers (IAC member) discussed that he could provide demonstration equipment from Rockwell Automation (refer to part B below) to enhance the laboratory training. He and Musat will coordinate a schedule and determine how to incorporate the equipment into a working lab for the students.

Dr. Don Trisel, (Interim Dean, College of Science and Technology) communicated that he is looking for any partnerships that could enhance the upgrade of equipment for the EET program and would try to work with such entities interested in this type of support.**"**

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?

The Electronic Engineering Technology program currently has two full-time faculty. No additional faculty will be required to accomplish the changes indicated within this document. The EET program recently purchased a new PLC system manufactured by Siemens and have begun to develop course work using this equipment. Our goal is to offer training whereby students will become certified by Siemens with PLC automation technology. One EET faculty member will be required to receive training from Siemens in order to certify qualifying students. One IAC member has offered to provide Rockwell Automation equipment free of charge to perform various lab procedures. The equipment will be returned to the vendor after each lab.

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**

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. No courses will be added or deleted from the general studies offerings. Students have more options in selecting courses that fulfill their general studies requirements.

VI. ADDITIONAL COMMENTS.

APPENDIX A

A.S. Degree in Electronics Engineering Technology

Current Program

Required Major Courses		**HRS**
ELEC 1100	Circuit Analysis I	3
ELEC 2200	Shop Practices	3
ELEC 2210	Circuit Analysis II	3
ELEC 2225	Electronic Devices	3
ELEC 2230	Digital Electronics	3
ELEC 2240	Industrial Electronics	3
ELEC 2250	AC/DC Machinery and Controls	3
ELEC 2260	Communication Systems	3
ELEC 2270	Microcomputer Systems	3
ELEC 2280	Programmable Controllers	3
MATH 1185	Applied Calculus I	4
MATH 1186	Applied Calculus II	4
TECH 1108	Engineering Graphics	3
COMP 1101	Applied Technical Programming	3
TOTAL Required Credit Hours Major Courses		44
Tech Electives		3
Free Electives		0
GS Required		13
TOTAL HOURS FOR MAJOR		**60**

B.S. Degree in Electronics Engineering Technology

Current Program

Required Major Courses		**HRS**
*ELEC 1100	Circuit Analysis I	3
ELEC 2200	Electronic Shop Practices	3
*ELEC 2210	Circuit Analysis II	3
ELEC 2225	Electronic Devices	3
*ELEC 2230	Digital Electronics	3
ELEC 2240	Industrial Electronics	3
ELEC 2250	AC/DC Machinery and Controls	3
ELEC 2260	Communication Systems	3
*ELEC 2270	Microcomputer Systems	3
ELEC 2280	Programmable Controllers	3
ELEC 3300	Advanced Linear Electronics	3
*ELEC 3310	Advanced Microcomputer Systems	3
ELEC 4401	Senior Electronics Project I	4
ELEC 4402	Senior Electronics Project II	3
ELEC 4410	Data Acquisition and Control Systems	4
MATH 1186	Applied Calculus II	4
MATH 1113	Applied Statistics	3
COMP 1101	Applied Technical Programming	3
TECH 1108	Engineering Graphics	3
PHYS 1102	Introduction to Physics II	4
SFTY 1000	Safety & Environmental Comp of Industry	3

TOTAL Required Major Courses	67
TECH Electives	9
Free Electives	3
GS-Required (*PHYS 1101)	41
*19 credit hours Required Courses for Minor in EET	

TOTAL HOURS FOR MAJOR (and minor if required)	**120**

Current Model Schedule

(First four semesters A.S. Degree)

First Semester - Freshman			**CHs**
ENGL 1104	Written English I		3
MATH 1185	Applied Calculus I		4
TECH 1108	Engineering Graphics		3
ELEC 1100	Circuit Analysis I		3
ELEC 2200	Shop Practices		3
	Total Credit Hours:	16	

Second Semester- Freshman			
COMM 2202	Introduction to Communications in World of Work		3
MATH 1186	Applied Calculus II		4
ELEC 2210	Circuit Analysis II		3
ELEC 2225	Electronic Devices		3
COMP 1101	Applied Technical Programming		3
	Total Credit Hours:	16	

Third Semester - Sophomore			
PHYS 1101	Introduction to Physics I		4
ELEC 2230	Digital Electronics		3
ELEC 2250	AC/DC Machinery and Controls		3
GS Health			3
	Total Credit Hours:	13	

Fourth Semester - Sophomore			
ELEC 2240	Industrial Electronics		3
ELEC 2260	Communication Systems		3
ELEC 2270	Microcomputer Systems		3
ELEC 2280	Programmable Controllers		3
Technical Elective			3
	Total Credit Hours:	15	

Associate of Science Degree in Electronics Engineering Technology		
	Total Credit Hours:	60

Fifth Semester - Junior

ELEC 3310	Advanced Microcomputer Systems	3
ENGL 1108	Written English II	3
SFTY 1100	Safety & Environmental Components of Industry	3
PHYS 1102	Introduction toPhysics II	4
MATH 1113	Applied Statistics	3
	Total Credit Hours:	16

Sixth Semester - Junior

ELEC 3300	Advanced Linear Electronics	3
HIST 1107	US History I	3
Tech Elective		3
ENGL 1109	Technical Report Writing	3
GS Interdisciplinary		3
	Total Credit Hours:	15

Seventh Semester - Senior

GS Arts		3
ELEC 4401	Senior Electronics Project I	4
ELEC 4402	Senior Electronics Project II	3
GS Social Science		3
Free Elective		3
	Total Credit Hours:	16

Eighth Semester - Senior

ELEC 4401	Senior Electronics Project I	4
MANF 2250	Total Quality & SPC	3
Technical Elective		3
GS Cultural Awareness		3
	Total Credit Hours:	13

Bachelor of Science Degree in Electronics Engineering Technology

Total Credit Hours: 120

APPENDIX A

A.S. Degree in Electronics Engineering Technology

Proposed

Required Major Courses		HRS
ELEC 1100	Circuit Analysis I	3
ELEC 1120	AC/DC Electronics Analysis	3
ELEC 2210	Circuit Analysis II	3
ELEC 2225	Electronic Devices	3
ELEC 2230	Digital Electronics	3
ELEC 2240	Industrial Electronics	3
ELEC 2250	AC/DC Machinery and Controls	3
ELEC 2280	Programmable Controllers	3
†MATH 1101	Applied Technical Math I	3
†MATH 1102	Applied Technical Math II	3
†TECH 2290	Engineering Analysis I	4
†TECH 3300	Engineering Analysis II	4
PHYS 1101	Introduction to Physics I	4
PHYS 1102	Introduction to Physics II	4
TOTAL Required Major Courses		46
Free/Tech Electives		0
GS - Required		14

†Students testing out of MATH 1101 and 1102 will be required to take MATH 1185 & 1186 during the Freshman Fall and Spring Semesters respectively in place of TECH 2290 and 3300 (to satisfy GS-IB Quantitative Literacy) and will be required to take ELEC 2270 Introduction to Microcontroller Systems and one technical elective during the Sophomore Fall and Spring Semesters respectively for an A.S. degree in EET (60 total credit hours).

TOTAL HOURS FOR MAJOR (and minor if required)	**60**

B.S. Degree in Electronics Engineering Technology

Proposed

Required Major Courses		**HRS**
*ELEC 1100	Circuit Analysis I	3
*ELEC 1120	AC/DC Electronics Analysis	3
*ELEC 2210	Circuit Analysis II	3
ELEC 2225	Electronic Devices	3
*ELEC 2230	Digital Electronics	3
ELEC 2240	Industrial Electronics	3
ELEC 2250	AC/DC Machinery and Controls	3
*ELEC 2270	Introduction to Microcontroller Systems	3
*ELEC 2280	Programmable Controllers	3
ELEC 3300	Advanced Linear Electronics	3
ELEC 3360	Communication Systems	3
ELEC 3310	Advanced Microcontroller Systems	3
ELEC 4401	Senior Electronics Project I	4
ELEC 4402	Senior Electronics Project II	3
ELEC 4410	Data Acquisition and Control Systems	4
ELEC 4420	Advanced Automation Controllers	3
†MATH 1101	Applied Technical Math I	3
†MATH 1102	Applied Technical Math II	3
†TECH 2290	Engineering Analysis I	4
†TECH 3300	Engineering Analysis II	4
PHYS 1101	Introduction to Physics I	4
PHYS 1102	Introduction to Physics II	4
CHEM 1101	General Chemistry	4
COMP 1101	Applied Technical Programming	3
TOTAL Required Major Courses		79
Free Electives		0
TECH Electives		6
GS - Required		35

†Students testing out of MATH 1101 and 1102 will be required to take MATH 1185 & 1186 during the Freshman Fall and Spring Semesters respectively (in place of TECH 2290 and 3300 to satisfy GS-IB Quantitative Literacy) and will be required to take an extra technical elective and one free elective (3 credit hours each) for a B.S. degree in EET (120 total credit hours).
*These courses are required (18 total credit hours) to Minor in EET.

TOTAL HOURS FOR MAJOR (and minor if required) 79

Required General Studies Courses		
Attribute IA – Critical Analysis		3
	ENGL 1108 old number (1102 = new number; also fulfills IE)	
Attribute IB – Quantitative Literacy		X
	MATH 1101 or MATH 1185 or Math 1190 (also required in major)	
Attribute IC – Written Communication		3
	ENGL 1104 old number (1101 = new number)	
Attribute ID - Teamwork		3
	student choice via available selections in category	
Attribute IE – Information Literacy		3
	ENGL 1108 old number (1102 = new number; also fulfills IA)	
Attribute IF – Technology Literacy		X
	student choice via available selections in category	
Attribute IG – Oral Communication		3
	COMM 2202	
Attribute II – Proficiency in the Major		X
	To Be Fulfilled By Major Courses	
Attribute III - Citizenship		3
	HIST 1107 or HIST 1108 (also fulfills VIIB)	
Attribute IV - Ethics		3
	student choice via available selections in category	
Attribute V - Health		2
	student choice via available selections in category	
Attribute VI - Interdisciplinary		3
	student choice via available selections in category	
Attribute VIIA - Arts		3
	student choice via available selections in category	
Attribute VIIB - Humanities		X
	HIST 1107 or HIST 1108 (also fulfills III)	
Attribute VIIC – Social Sciences		3
	student choice via available selections in category	
Attribute VIID - Natural Science		X
	Intro to Physics I (also required in major)	
Attribute VIII – Cultural Awareness		3
	student choice via available selections in category	
TOTAL GENERAL STUDIES HOURS		**35**
TOTAL TECHNICAL ELECTIVES		**6**
TOTAL HOURS		**120**

Electronics Engineering Technology Proposed 2 and 4 Year Program

Model Schedule

(First four semesters A.S. Degree)

First Semester - Freshman			**CHs**
ENGL 1101	Written English I		3
†MATH 1101	Applied Technical Math I		3
*ELEC 1100	Circuit Analysis I		3
*ELEC 1120	AC/DC Electronics Analysis		3
		Total Credit Hours: 12	

Second Semester- Freshman			
ENGL 1102	Written English II		3
†MATH 1102	Applied Technical Math II		3
GEN Studies	TEAMWORK Category GS-ID (Student Choice)		3
*ELEC 2210	Circuit Analysis II		3
ELEC 2225	Electronic Devices		3
		Total Credit Hours: 15	

Third Semester - Sophomore			
PHYS 1101	Introduction to Physics I		4
GEN Studies	HEALTH Category GS-IV (Student Choice)		2
†TECH 2290	Engineering Analysis I		4
*ELEC 2230	Digital Electronics		3
ELEC 2250	AC/DC Machinery and Controls		3
		Total Credit Hours: 16	

Fourth Semester - Sophomore			
PHYS 1102	Introduction to Physics II		4
COMM 2202	Introduction to Communication in World of Work		3
†TECH 3300	Engineering Analysis II		4
ELEC 2240	Industrial Electronics		3
*ELEC 2280	Programmable Controllers		3
		Total Credit Hours: 17	

Associate of Science Degree in Electronics Engineering Technology		
	Total Credit Hours:	60

†If the student Tests out of MATH 1101 and 1102, MATH 1185 and 1186 should be taken (in place of TECH 2290 and 3300) to satisfy General Studies Requirement IB Quantitative Literacy and will be required to take ELEC 2270 Introduction to Microcontroller Systems and one technical elective during the Sophomore Fall and Spring Semesters respectively for an A.S. degree in EET.

Fifth Semester - Junior

COMP 1101	Applied Technical Programming	3
GEN Studies	ETHICS Category GS-IV (Student Choice)	3
GEN Studies	ART Category GS-VIIA (Student Choice)	3
ELEC 3360	Communication Systems	3
*ELEC 2270	Introduction to Microcontroller Systems	3
	Total Credit Hours:	15

Sixth Semester - Junior

CHEM 1101	General Chemistry	4
GEN Studies	TECHNOLOGY LITERACY Category GS-IF (Student Choice)	3
GEN Studies	CULTURAL AWARENESS Category GS-VIII (Student Choice)	3
ELEC 3300	Advanced Linear Electronics	3
ELEC 3310	Advanced Microcontroller Systems	3
	Total Credit Hours:	16

Seventh Semester - Senior

GEN Studies	SOCIAL SCIENCE Category GS-VIIC (Student Choice)	3
Technical Elective		3
ELEC 4410	Data Acquisition and Control Systems	4
ELEC 4420	Advanced Automation Controller Systems	3
	Total Credit Hours:	13

Eighth Semester - Senior

GEN Studies	INTERDISCIPLINARY Category GS-VI (Student Choice)	3
HIST	1107 or 1108 US History (Citizenship Category GS-III)	3
Technical Elective		3
ELEC 4401	Senior Electronics Project I	4
ELEC 4402	Senior Electronics Project II	3
	Total Credit Hours:	16

Bachelor of Science Degree in Electronics Engineering Technology

Total Credit Hours: 120

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†Students testing out of MATH 1101 and 1102 will be required to take MATH 1185 + 1186 during the Freshman Fall and Spring Semesters respectively (in place of TECH 2290 and 3300 to satisfy GS-IB Quantitative Literacy) and will be required to take one technical elective and one free elective (3 credit hours each) for a B.S. degree in EET.
*These courses are required (18 Credit Hours) to Minor in EET.

Appendix B
Electronics Engineering Technology
Proposed New Course Descriptions

Course number	Title	Credit Hour
ELEC 1120	**AC/DC Electronics Analysis**	**3**

This course introduces students to the concepts of measuring voltage, current, and resistance of various ac and dc circuits. Students will build electronic circuits on a breadboard using discrete and integrated circuit components. The student will be introduced to circuit design and construction, and learn to read a schematic diagram. The student will also be familiarized with soldering components on surface mount and through-hole printed circuit boards. Commonly used electronic instruments, such as the digital multimeter, oscilloscope, function generator, and power supplies will be covered and utilized extensively in a lab setting. The student will learn how to use simulation software and make comparisons between theoretical and real-world results. Co-Req: ELEC 1100

ELEC 4420	**Advanced Automation Controller Systems**	**3**

Automation controllers are used in the manufacturing and process industries. This course is designed to provide the student with a strong background in system automation using controllers on multiple system platforms. The student will learn how to identify the right hardware platform for a specific application, set-up a communication network between the system's elements, and create computer code for Programmable Logic Controllers (PLC) and Human Machine Interface (HMI) components. Other topics covered include control systems for electric motors, AC and DC motor drives. This course is a combination of lecture and lab to develop practical automation design applications. Students successfully completing this course will qualify for a certifying exam for one of the system platforms presented. PR: ELEC 2280

Appendix 4 for Outcome Competencies and Methods of Assessment for the new courses in the proposed Electronic Engineering Technology program

Course: ELEC 1120 **AC/DC Electronics Analysis**

Course Outcomes	Direct Assessment Measures	Satisfactory Performance Standards
Upon successful completion of this course, students will be able to	Student performance with respect to this outcome will be measured by	Satisfactory student performance on the direct assessment measure will consist of
1. Measure and theorize using ohms law basic electrical quantities including Voltage, Current, and Resistance values in a circuit.	Minimum: Five labs and one quiz.	Satisfactory student performance will be indicated by 70% minimum on lab and quizzes. Satisfactory class performance will be indicated by 70% of the class meeting the minimum requirement.
2. Develop a circuit on a breadboard and through simulation from a schematic diagram.	Minimum: Five labs for breadboard and three labs and one homework assignment for simulation exercises.	Satisfactory student performance will be indicated by 70% minimum on lab and homework assignments. Satisfactory class performance will be indicated by 70% of the class meeting the minimum requirement.
3. Demonstrate how resistors, diodes, capacitors, inductors, and certain integrated circuits perform in a circuit.	Minimum: Five labs and one quiz.	Satisfactory student performance will be indicated by 70% minimum on labs and exam and assignments. Satisfactory class performance will be indicated by 70% of the class meeting the minimum requirement.

Course: **ELEC 4420** **Advanced Automation Controller Systems**

Course Outcomes	Direct Assessment Measures	Satisfactory Performance Standards
Upon successful completion of this course, students will be able to	Student performance with respect to this outcome will be measured by	Satisfactory student performance on the direct assessment measure will consist of
1. Design a PLC application according to a narrative description.	Minimum: Three lab assignments, one project.	Satisfactory student performance will be indicated by 70% minimum on lab assignments and project. Satisfactory class performance will be indicated by 70% of the class meeting the minimum requirement.
2. Design automation controls using multiple platforms to control AC and DC motors.	Minimum: Three lab assignments, one project.	Satisfactory student performance will be indicated by 70% minimum on lab assignments and project. Satisfactory class performance will be indicated by 70% of the class meeting the minimum requirement.
3. Develop sophisticated HMI for various projects.	Minimum: Four lab assignments, one project.	Satisfactory student performance will be indicated by 70% minimum on lab assignments and project. Satisfactory class performance will be indicated by 70% of the class meeting the minimum requirement.

Appendix 5: show confirmation for use of courses from their programs for inclusion in the Electronics Engineering Technology program

1) COURSE NAME: AC/DC Electronics Analysis Tentative Syllabus
COURSE NUMBER: ELEC 1120
2) Lecture Information: 3 credit hours
Location: 307 Engineering Technology Building
Meeting day(s): M W
Meeting time(s): 8 – 9:50 AM
3) Instructor Name: Thomas M. McLaughlin
Email: Thomas.McLaughlin@fairmontstate.edu
Office location: 403 ET Building
Office hours: See Office Posted Hours
Phone: (304) 367-4915
Fax: (304) 367-4934
4) Required Textbook(s):

Workbook supplied by FSU on Blackboard or Moodle

Optional References: None

Other Tools/Supplies: Scientific Calculator, Breadboard, Basic Prototyping Parts Kit, DMM, 2 solder kits, tool kit, soldering iron. All of the above are in stock at the bookstore in the Falcon Center.

Software: Provided by FSU

5) Course description: This course introduces students to the concepts of measuring voltage, current, and resistance of various AC and DC circuits. Students will build electronic circuits on a breadboard using discrete and integrated circuit components. The student will be introduced to circuit design, construction and learn to read a schematic diagram. The student will also be familiarized with soldering components on surface mount and through-hole printed circuit boards. Commonly used electronic instruments, such as the digital multi-meter, oscilloscope, function generator, and power supplies will be covered and utilized extensively in a lab setting. The student will learn how to use simulation software and make comparisons between theoretical and real-world results.

Course Pre-requisite(s): None
Course Co-requisite(s): ELEC 1100
Delivery Method: The course takes place in an electronic lab setting. Blackboard will supplement course management. Students will be required to access the course syllabus, assignments, and grades from Blackboard.

6) Course outcomes: At the end of this course, students will be able to:
1. Demonstrate basic engineering electronic principals utilizing Ohms and Kirchhoff's laws.
2. Demonstrate how to interpret a schematic diagram and connect electronic components on a breadboard, utilize electronic instruments to test and analyze the circuit.

3. Demonstrate the ability to take measurements of basic AC and DC electronic quantities including voltage, current, and resistance and compare against theoretical values.
4. Explain the differences between series and parallel circuits.
5. Create, make measurements, and analyze the behavior of various electronic circuits in a simulation application.
6. Demonstrate the fundamentals of soldering by soldering components to a surface mount and a through-hole printed circuit boards.

7) Topics covered:

A. Understanding Schematic Symbols and Components
    1. How to read a schematic
    2. Using a Multimeter to make measurements
    3. Understanding the Breadboard
B. Resistors
    1. The resistor color code
    2. Series Resistance
    3. Parallel Resistance
    4. Parallel-Series Circuits
C. Introduction to Simulation Software
D. The Voltage Divider
    1. Using discrete components on a breadboard
    2. Simulation Software
E. The Basic Transistor Circuit
F. The LM555 Integrated Circuit
G. AC Circuits
    1. Using the Oscilloscope
    2. Using the Function Generator
H. Other General Purpose Electronic Components
    1. General Purpose and Zener Diode
    2. Capacitor
    3. Inductor
    4. Seven Segment Display
    5. Common Emitter Transistor Circuit
I. Introducing Soldering
    1. Through-Hole Printed Circuit Board
    2. Surface Mount Printed Circuit Board

8) Grade Information:

Student Grades: Each student is solely responsible for his/her grade average. This evaluation is objective and based on weekly homework, class assignments, weekly quizzes, and two exams. There shall be no curving or bonuses in this class. All grades are based entirely on the student's performance.

Grade Scale	Grades are comprised of:	Weight (%)	Tentative Dates
A: 90%-100%	Homework and Class Assignments	15	TBA
B: 80%-89.9%	Lab	45	TBA
	Quizzes	15	TBA

C: 70%-79.9%			
D: 60%-69.9%	Comprehensive Final	25	TBA
F : <60%			

9) Policies/Procedures

Students enrolled in the Department of Technology programs at Fairmont State University will primarily be concerned with applying established scientific and engineering knowledge and methods combined with technical skills in support of engineering activities.

Professionalism and Classroom Etiquette:

Students will gain the most from this course if they treat it as a work or professional experience. Being prepared in the classroom means reading *and* comprehending all assignments prior to class meetings. Maintaining and organizing class documents will prepare you for future courses and future goals after you leave this program.

a. No Tobacco or food is permitted in the Classroom
b. Closed drinking containers are permitted in the classroom.
c. No Cell Phone use during class.
d. Professionalism is expected at all times. Using foul language or showing disrespect to others will not be tolerated.

Student Workload:

This is a professional setting and a high level of work ethic is expected. It is the ***STUDENT'S*** responsibility to participate in classroom discussions and to be prepared (this is accomplished by reading, comprehending, and working problems out of the text). It is the ***INSTRUCTOR'S*** responsibility to identify key topics from the text and to present real world projects and experiences into the classroom. Students are responsible for attending class; completing examinations, quizzes, assignments and projects**.**

Student Evaluation:

Each student is solely responsible for his/her grade average. This evaluation is objective and based on multiple exams, quizzes, homework assignments and projects. There shall be no curving or bonuses in this class. All grades are based entirely on the student's performance.

10) Student Assistance:

Disability Services: Services are available to any student, full or part-time, who has a need because of a [documented] disability. It is the student's responsibility to register for services with the coordinator of students with disabilities and to provide any necessary documentation to verify a disability or the need for accommodations. The Coordinator of Disability Services, Andrea Pammer, is located in Colebank Hall 307. The office phone is (304) 367-4686.

1) COURSE NAME: Advanced Automation Controller Systems (Tentative Syllabus)
COURSE NUMBER: ELEC 4420

2) Lecture Information: 3 credit hours
Location: 309 Engineering Technology Building
Meeting day(s): TBD
Meeting time(s): TBD

3) Instructor Name: Musat Crihalmeanu, PE
Email: mcrihalmeanu@fairmontstate.edu
Office location: Room 410 ET Building
Office hours: Posted
Phone: (304) 367-4105
Fax: (304) 367-4934

4) Required Textbook(s):

1. Programmable Logic Controllers
Author: Frank Petruzella; 4th Edition, McGraw Hill – 2011

2. Programmable Logic Controllers
Authors: Khaled Kamel and Eman Kamel, 1st Edition, McGraw Hill - 2014

Optional References:
3. Electric Motors and Control Systems
Author: Frank Petruzella; 1st Edition, McGraw Hill – 2010

Optional References: None
Other Tools/Supplies: Scientific Calculator
Software: TIA Portal Development System for SIEMENS S7-1200 platform
LogixPro Simulator and Connected Components Workbench for Allen Bradley Control Logix 5000 platform. C-more HMI for Automation Direct.

5) Course description: Automation controllers are used in the manufacturing and process industries. This course is designed to provide the student with a strong background in system automation using controllers on multiple system platforms. The student will learn how to identify the right hardware platform for a specific application, set up a communication network between the system's elements, and create computer code for Programmable Logic Controllers (PLC) and Human Machine Interface (HMI) components. Other topics covered include control systems for electric motors, AC and DC motor drives. This course is a combination of lecture and lab to develop practical automation design applications. Students successfully completing this course will qualify for a certifying exam for one of the system platforms presented.

Course Pre-requisite(s): ELEC 2280
Course Co-requisite(s): None
Delivery Method: The course will be delivered via lecture and hands-on lab assignments.

6) Course outcomes: (Tentative Outcomes)
At the end of this course, students will be able to:

1. Design a PLC application according to a narrative description of the application.
2. Understand and design automation controls using advanced platforms.
3. Understand how to control AC and DC motors using PLCs (Programmable Logic Controllers) and VFDs (Variable Frequency Drives).
4. Demonstrate how to interface with analog and digital signals.
5. Understand how to develop HMI (human machine interface) and PLC Ladder Logic programs for various real-world applications.

7) Topics covered: (Tentative Outline)

A. System overview, discussion of platforms, and connectivity
B. Review of program control
    1. Subroutines
    2. Batch Processes
C. Data Communications
    1. Understanding Controller Networks
    2. Various Topologies
D. Programming Techniques
E. AC and DC Motors
    1. Electro-Mechanical Systems
    2. Electric Drive Systems
F. Analog I/O applications and digital I/O
G. Pulse Width Modulation (PWM)
H. Introduction to Proportional-Integral-Derivative (PID)
    1. Calculating Error and Desired Set point
I. Human-Machine-Interface (HMI)
    1. Combining Visualization and Control
J. Programming HMI applications

8) Grade Information:

Student Grades: Each student is solely responsible for his/her grade average. This evaluation is objective and based on weekly homework, class assignments, weekly quizzes, and two exams. There shall be no curving or bonuses in this class. All grades are based entirely on the student's performance.

Grade Scale	Grades are comprised of:	Weight (%)	Tentative Dates
A: 90%-100%	Homework	10	TBA
B: 80%-89.9%	Quizzes	10	TBA
C: 70%-79.9%	Lab Work	20	TBA
D: 60%-69.9%	Projects	40	TBA
F : <60%	Comprehensive Final	20	TBA

9) Policies/Procedures

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c. No Cell Phone use during class
d. Professionalism includes no foul language and showing respect for the instructor and students

Student Workload:
This is a professional setting and a high level of work ethic is expected. It is the ***STUDENT'S*** responsibility to participate in classroom discussions and to be prepared (this is accomplished by reading, comprehending, and working problems out of the text). It is the ***INSTRUCTOR'S*** responsibility to identify key topics from the text and to present real world projects and experiences into the classroom. Students are responsible for attending class; completing examinations, quizzes, assignments and projects**.**
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