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March 18, 2015

MEMORANDUM

TO: State Board of Regents

FROM: David L. Buhler

SUBJECT: Utah Valley University – Bachelor of Science in Mechatronics Engineering Technology

Issue

Utah Valley University (UVU) requests approval to offer a new Bachelor of Science in Mechatronics Engineering Technology effective Fall Semester, 2015. The program was approved by the UVU Board of Trustees on December 4, 2014.

Background

Mechatronics Engineering Technology encompasses the fields of mechanics, electronics, and control of industrial processes. The program has been developed to train graduates to design and build industrial automation components and systems, upgrade automation systems, and develop electromechanical products using the principles of programmable logic controllers, sensors, pneumatics, actuators, industrial robots, and CAD. The Bachelor of Science in Mechatronics Engineering Technology at Utah Valley University builds on the success of the existing Associate of Applied Science (AAS) in Mechatronics Engineering Technology and allows for a seamless and stackable transition from the AAS degree to the Bachelor of Science degree. The degree is designed to lead directly to employment with companies that produce automotive components, medical devices, semiconductors, food products, packaging, sporting goods, and raw materials. The program has been structured to be in line with Accreditation Board for Engineering and Technology accreditation requirements.

There is not a specific Standard Occupational Classification (SOC) code for mechatronics technicians so there is not data specific to the occupation. That said, an indication of labor market conditions can be inferred by looking at data associated with related SOC codes. Electrical and Electronics Engineering Technician (SOC code 17-3023) and Mechanical Engineering Technician (SOC Code 17-3027) are the closest to mechatronics technicians. Staff reviewed Utah Department of Workforce Services Utah Occupational Projections 2012-2022. In 2012, there were an estimated 1,770 electrical and electronics engineering technician workers with a 2022 projection of 1,980 representing an annual growth rate of 1.2% and a total of 60 annual openings, resulting in a four-star rating for this classification. Median hourly wage

was reported to be $27.30. There were 630 mechanical engineering technicians in 2011 with a projected estimate of 720 in 2022 with 20 annual openings and a 1.4% growth rate, giving this classification a three-star rating. Median hourly wage was reported to be $24.40.

While there are some related courses and programs within the Utah System of Higher Education (USHE), the BS in Mechatronics Engineering Technology does not currently exist within USHE. It is an applied technology program designed to support the implementation of automation systems in manufacturing environments, and is not in conflict with other engineering or engineering technology programs.

Policy Issues

The proposed program has been developed through established institutional procedures and Board of Regents policy. Chief academic officers as well as faculty in related departments from the USHE institutions have reviewed the proposal and have provided input. There are no additional policy issues that need to be addressed relative to approval of the program.

Commissioner's Recommendation

The Commissioner recommends the Board of Regents approve Utah Valley University's request to offer the Bachelor of Science in Mechatronics Engineering Technology.

_____
David L. Buhler
Commissioner of Higher Education

DLB/BKC
Attachment

Program Description
Utah Valley University
Bachelor of Science in Mechatronics Engineering Technology

Section I: The Request

The Department of Engineering Technology in the College of Technology and Computing at Utah Valley University (UVU) requests approval to offer a Bachelor of Science in Mechatronics Engineering Technology effective Fall 2015. This program was approved by the UVU Board of Trustees on December 4, 2014.

Section II: Program Description

Complete Program Description

The Mechatronics Engineering Technology Bachelor of Science will prepare students to work in the manufacturing sector of the Utah economy as automation engineering technologists and designers. Graduates will realize strong demand from employers as they enter into challenging and rewarding careers. Students will build a strong skillset in the principles of electronics, mechanics, programmable logic controllers (PLCs), and industrial sensors that will be used throughout their careers in a wide range of manufacturing systems. Using their skills in pneumatics, mechanics, electronics, controls, and computer systems, graduates from this program will design, modify, and troubleshoot complex automation systems that are used to produce a wide variety of consumer products. The mechatronics engineering technology program uses laboratory exercises and hands on projects as the major mode of teaching, and students are encouraged to participate in summer internships, coop experiences, and part time work in industry to supplement their education. The combination of practical skills and applied theory results in a broad based education that makes the graduates from this program very competitive in today's technology-based manufacturing marketplace. This proposed bachelor of science (BS) program builds upon an existing associate of applied science (AAS) program in mechatronics. Students who complete the mechatronics AAS program can seamlessly transition into the BS degree program.

Purpose of Degree

The purpose of developing the Mechatronics Engineering Technology Bachelor of Science degree is to meet the increasing demand for employees trained directly in the design and operation of automation systems with an emphasis in PLC based controls. The University of Utah and Utah State University provide excellent classical engineering degrees, as well as offering specific courses in mechatronics and control systems; but the depth of the courses, as well as peripheral offerings, are somewhat limited by the broad spectrum curriculum. This proposed program of study goes beyond the offerings of classical engineering programs and includes basic electronics, CAD, mechanical components, PLCs, industrial robots, CNC programming, industrial networks, automation motors, speed and motion control of motors, materials, and a capstone project in conjunction with several writing, physics, chemistry, and business courses. This applied training, that encompasses the skills required to effectively work in automation based production, will result in a strong demand for graduates from this program.

This degree is intended to be a terminal degree, and graduates are expected to transition directly into industry. This degree is designed as an engineering technology degree, and the courses will not generally transfer directly into a classical engineering program.

Institutional Readiness

Utah Valley University is well positioned to initiate and grow the Mechatronics Engineering Technology Bachelor of Science program because the university combines an established foundation in teaching with strong industrial expertise of the faculty. Currently, there are excellent lab facilities in place to support an existing program in Electrical Automation and Robotic Technology (EART), but the facilities are approaching their maximum capacity as the EART program has added a second cohort. The mechatronics program must develop independent lab facilities to support both the AAS and BS degrees. It is assumed in presenting these costs that the students in the mechatronics program will be required to own or rent their own laptop computer that they will use throughout the program, and the university will not shoulder the cost of computers or computer support for the mechatronics labs. At 1000 square feet, CS 511 is the only lab space available for the mechatronics program (at this date), and it is fully utilized during daytime class hours for both lectures and labs. An additional 3000 square feet of lab/classroom space must be added to accommodate the third and fourth year sections.

CS 511 has already been converted to a dedicated classroom/lab that will accommodate 15 students and has been outfitted with appropriate electrical equipment used to teach the first two semesters of the mechatronics courses. To handle the junior and senior classes, a 1500 square foot lab with $20,000 of equipment will need to be in place Fall 2015 and another 1500 square foot lab with $30,000 of equipment will be needed for Fall 2016. As the program continues to grow and the senior level courses are taught, industrial robots and machine interface panels will need to be added to the labs. Six industrial robots will be required the first time the Industrial Robots course is taught in the sixth semester (Spring 2017). With an educational discount, startup costs for the industrial robotics lab will be $108,000. This amount will be offset by Perkins grants and donations from industry partners.

Departmental Faculty

Currently, two full-time faculty members each teach between 25 and 30 credits per year in the mechatronics AAS. In order to fully support the BS degree, two additional faculty members will be required as the BS degree comes online. It is expected that one faculty member will be added each year beginning Fall Semester, 2015. The most important qualification to teach in the BS mechatronics program will be five years of relevant industrial experience, and it is intended that the faculty profile will be a master's degree with at least five years of relevant industrial experience.

Faculty Category	Faculty Headcount – Prior to Program Implementation	Faculty Additions to Support Program	Faculty Headcount at Full Program Implementation
With Doctoral Degrees (Including MFA and other terminal degrees, as specified by the institution)			
Full-time Tenured			0
Full-time Non-Tenured		1	1
Part-time Tenured			
Part-time Non-Tenured			0
With Master's Degrees			
Full-time Tenured			0

Full-time Non-Tenured	2		2
Part-time Tenured			
Part-time Non-Tenured			0
With Bachelor's Degrees			
Full-time Tenured			0
Full-time Non-Tenured		1	1
Part-time Tenured			
Part-time Non-Tenured			0
Other			
Full-time Tenured			0
Full-time Non-Tenured			
Part-time Tenured			
Part-time Non-Tenured		0.2	0.2
Total Headcount Faculty			
Full-time Tenured	0	0	0
Full-time Non-Tenured	2	2	4
Part-time Tenured	0	0	0
Part-time Non-Tenured	0	0.2	0.2
Total Department Faculty FTE (As reported in the most recent A-1/S-11 Institutional Cost Study for "prior to program implementation" and using the A-1/S-11 Cost Study Definition for the projected "at full program implementation.")	2	2.20	4.20

Staff

The mechatronics program is already served by one academic advisor. It is not anticipated to add another academic advisor in the near future. The growth of the mechatronics BS degree may, however, require the hiring of a full-time lab technician to assist in the operation of the teaching labs.

Library and Information Resources

In addition to the existing permanent library holdings, the students have sufficient electronic access to online teaching materials. For this field of study, most of the necessary information regarding vendor technical support, equipment specifications, product manuals, application notes, and downloads are available online and are frequently updated. These resources, supplemented with faculty expertise, are sufficient for students to reference up to date technical information.

Admission Requirements

Students may enter the mechatronics program as freshman. The principal issue for incoming students to be aware of is the requirement of MATH. It is suggested that students take MATH 1050 the first semester of enrollment, but if they do not take it the first semester they must take it the second semester or during the summer.

Student Advisement

The College of Technology and Computing Advisement Center provides an advisor that is fully trained in the program requirements of the mechatronics program.

Justification for Graduation Standards and Number of Credits

- Completion of a minimum of 121 semester credits with a minimum of 40 upper division credits.
- Overall grade point average of 2.0 or better with a minimum grade of C- in all mechatronics courses.
- Minimum of 30 credit hours through course attendance at UVU.
- Completion of all General Education courses including a Global/Intercultural requirement course.

External Review and Accreditation

This program has been developed in response to an increasing demand from industrial contacts that have voiced an expanding problem of recruiting and employing qualified individuals to meet their technical requirements. It is becoming increasingly difficult to find technologists with in-depth training in automation technology. The purpose of this proposed program is to provide graduates with the in-depth education required by industry and to prepare them to work in the automation industry along the Wasatch Front. The technical niche that is targeted by this program is a shortage of skilled technologists that are specifically trained in industrial controls, programmable logic controllers (PLC's), and all of integrated technology used in production systems.

At the beginning of developing the mechatronics program, industry advisors provided input on general automation projects that they required in their facilities. The overall courses were developed directly from their input as well as faculty experience in the automation industry. As specific courses were defined, the advisors were contacted again about specific content requirements, and they provided very detailed comments about courses and content, including details such as suggested types and brands of equipment that are industry standards.

The proposed program has been structured to be in line with ABET accreditation requirements. From the beginning, the documentation and data will be collected towards future accreditation.

Projected Program Enrollment and Graduates; Projected Departmental Faculty/Students

Data Category	Current – Prior to New Program Implementation	Projected				
		Year 1 (15-16)	Year 2 (16-17)	Year 3 (17-18)	Year 4 (18-19)	Year 5 (19-20)
Data for Proposed Program						
Number of Graduates in Proposed Program	0	0	15	18	18	18

Total # of Declared Majors in Proposed Program	-	35	55	55	55	55
Departmental Data – For All Programs Within the Department						
Total Department Faculty FTE (as reported in Faculty table above)	2.80	3.80	4.20	4.20	4.20	4.20
Total Department Student FTE (Based on Fall Third Week)	22	36	49	49	49	49
Student FTE per Faculty FTE (ratio of Total Department Faculty FTE and Total Department Student FTE above)	7.9	9.5	11.67	11.67	11.67	11.67
Program accreditation-required ratio of Student FTE/Faculty FTE, if applicable: (Provide ratio here:_____)	NA	NA	NA	NA	NA	NA

Expansion of Existing Program

The proposed BS degree in Mechatronics Engineering Technology is built upon the existing AAS degree in Mechatronics Technology and has been designed to provide a seamless transition from the AAS to the BS degree. It will not require any additional prerequisites or contain any hidden credits. The AAS in Mechatronics Technology is only a few years old, but is being revised and upgraded in tandem with this degree to provide a seamless transition from the AAS to the BS degrees.

Incoming freshmen enrolling in the mechatronics AAS program are tabulated. Enrollments peaked to 31 in 2010-2011 because grant money was still available to fund many of the incoming students. There was an enrollment dip in 2012-2013 due to LDS missions, but enrollments are recovering. There are now 15 students enrolled in the freshman class.

Section III: Need

Program Need

Because of the strong manufacturing base in Utah, the demand for workers specifically trained in automation engineering technology is also strong. The strong demand for graduates from the mechatronics AAS program is based on specifically targeting the needs of automation based manufacturers in Utah and teaching the skills directly applicable to the needs of industry. There is a growing need for technicians that are trained beyond the AAS level that know how to lay out, design, and integrate complex production systems that are based on sensors, pneumatics, PLCs, motors, controls, and custom designed mechanical components. In Utah, this applied automation technology based skill set is not directly targeted by the major universities in their classical engineering programs, and this proposed BS program does not conflict with these existing engineering or technology programs. The purpose of this proposed program is to specifically train technologists to directly enter the workforce as automation engineering technologists.

Labor Market Demand

The Department of Workforce Services Utah Metro Occupational Projections does not list mechatronics in their annual employment outlook report, but they do list Electrical and Electronics Engineering Technicians, Industrial Engineering Technicians, Mechanical Engineering Technicians, and Engineering Technicians in general. The Electrical and Electronics Engineering Technician and Mechanical Engineering Technician classifications are the closest to Mechatronics and Automation Technology. In 2011, there were 2,250 electronics technician workers with a 2013 projection of 2,340 with an annual growth of 3.0% and a total of 110 annual openings, resulting in a four-star rating for this classification. There were 590 mechanical technician workers in 2011 with a projected estimate of 620 in 2013 with 30 annual openings and a 2.6% growth rate, giving this classification a five-star rating. This data shows a strong and vibrant manufacturing sector and indicates that there will be a growing demand for Mechatronics Engineering Technologists.

Charts from the US Department of Labor Bureau of Labor Statistics show that there is a demand for electromechanical technicians nationwide. Utah is one of the leaders in annual mean wage, as well as a significant employer of technicians, indicating that this is a viable educational program to supply the technical labor market in Utah.

IM Flash Technology, an industry supporter for this new degree, decided to increase their annual scholarship donation from $5,000.00 to $10,000.00 to support this program in order to meet their increasing hiring need.

Student Demand

All of the second year students currently enrolled in the mechatronics AAS have indicated that they are going to continue their education in a four-year degree program. Some of them have, or will soon, enroll in Mechanical Engineering at Brigham Young University, University of Utah, or Utah State University; and one student has enrolled in the Technology Management Program at UVU. In UVU's service region, many schools teach mechatronics courses. For example, in Nebo School District, Lego Mindstorms kits are used in the junior high schools, and Parallax systems are used in some junior high schools in the Alpine School District. The high school teachers have indicated that the students that have talked about the AAS in Mechatronics Technology have said that they are all interested in a four-year degree. The high school teachers have also indicated that they would be able to send many of their students to UVU if a four-year degree was offered in mechatronics.

Similar Programs Offered in the USHE

The BS in Mechatronics Engineering Technology does not exist elsewhere in the State of Utah. It is an applied technology program required to support the implementation of automation systems in manufacturing systems, and is not in conflict with other engineering or engineering technology programs.

The University of Utah offers a Mechatronics Certificate from the College of Engineering upon completion of 14 credit hours selected from a list of recommended classes. Utah State University offers ECE 5320 - Mechatronics, ECE 5340 - Mobile Robots, and ECE/MAE 7750 - Distributed Control Systems, all at the graduate level; and Brigham Young University offers IT 548 - Mechatronics that can be taken either in the senior year or first year as a graduate student.

The closest equivalent to the proposed degree is the Electronics Engineering Technology (EET) program at Weber State University (WSU) where they prepare graduates to specify, install, operate, troubleshoot, and modify computers, embedded controllers, and electronic systems. The WSU program is designed to give

students fundamental knowledge and basic skills in robotics, automation, electronic manufacturing, fabrication, testing, and troubleshooting. The proposed program includes a strong CAD and mechanical design component as well as PLC selection and programming, pneumatics and hydraulics, industrial sensors, and automation system motors. The proposed BS mechatronics degree does not significantly overlap with the EET program at WSU.

Collaboration with and Impact on Other USHE Institutions

The BS in Mechatronic Engineering Technology does not exist at other universities and colleges in the State of Utah. It is created to meet the demands of students and industry for additional training beyond the current AAS degree in Mechatronics Technology at UVU.

Benefits

The economic growth of the State of Utah is impacted by the ability to provide an adequately trained workforce for industry within the state. The graduates with an AAS in Mechatronics Technology are in high demand within the state, because they fill the need for specialists that can operate and design the complex equipment found in industry. Advances in industrial robots and PLC technology, and a lack of trained technicians, have caused industry to look outside of the State of Utah to find skilled employees. The proposed BS in Mechatronics Engineering Technology will provide industry with those much needed graduates that are trained and ready to start a successful career. The proposed BS degree provides a pathway for graduates with an AAS in Mechatronics Technology to develop the advanced skills required by industry. The result is a better trained workforce that meets the needs of the manufacturing industry.

Consistency with Institutional Mission

Utah Valley University is a Master's College and University according to the Utah System of Higher Education R312 document. Section 4.2 of R312 states that the institution's mission "is to transmit knowledge and skills primarily through undergraduate programs at the associate and baccalaureate levels, including career and technical education programs. . . . The institution contributes to the quality of life and economic development at the local and state levels."

A Bachelor of Science in Mechatronics Engineering Technology is an applied educational experience that will prepare graduates to immediately accept employment in local industry as technicians, technologists, designers, and managers. This outcome perfectly fits the role and mission of the Utah System of Higher Education for Master's Colleges and Universities.

Section IV: Program and Student Assessment

Program Assessment

Goals:

1. Provide relevant training so that the graduates of the Bachelor of Science in Mechatronics Engineering Technology will be able to find gainful employment in Utah.
2. Provide an opportunity for students with AAS degrees in related fields to successfully matriculate into the program.
3. Provide graduates that will satisfy the needs of the manufacturing sector with employees trained to design, operate, and integrate their automation technology systems.

Assessment:

1. The graduation rate of the entering students will be evaluated to determine where any program improvements are required.
2. Industry employer surveys will be completed to address the performance of the graduates in the working environment.
3. The Academic Advisory Council will be utilized to address any recommended changes in the degree content to meet the changing needs of industry.

Expected Standards of Performance

The BS in Mechatronic Engineering Technology is designed to prepare students to enter the workforce with sufficient competency to design, operate, and upgrade industrial automation systems. This includes evaluation of non-operating systems and their repair; selection of automation equipment, construction of systems, wiring, and programming of the control systems; and operating of the automation systems for production. Program graduates will:

- Demonstrate proficiency in basic automation technology subjects including: (a) electronic mathematics, (b) AC and DC circuits and components, (c) computer architecture (d) programmable logic controllers (PLC's), (d) industrial pneumatic and hydraulic systems, and (e) CAD based mechanical design.
- Demonstrate appropriate technical reading, writing, and communications skills.
- Demonstrate proficiency in mathematics appropriate for automation technology.
- Demonstrate proficiency in design, analysis, operation, and troubleshooting of automation systems, including: (a) automation motors (servo, stepper, PMDC, and BLDC), (b) industrial pneumatics (actuators, valves etc.), (c) PID speed and position controls, and (d) kinematics/dynamics of machines (motion analysis, linkages, and mechanisms).
- Master PLC programming, operation, and structure for automation systems.

Section V: Finance

Department Budget

3-Year Budget Projection							
Departmental Data	Current Departmental Budget – Prior to New Program Implementation	Departmental Budget					
		Year 1		Year 2		Year 3	
		Addition to Budget	Total Budget	Addition to Budget	Total Budget	Addition to Budget	Total Budget
Personnel Expense							
Salaries and Wages	$170,534	$74,000	$244,534	$78,276	$322,810	$5,851	$328,661
Benefits	$79,054	$32,720	$111,774	$35,397	$147,171	$2,707	$149,878
Total Personnel Expense	$249,588	$106,720	$356,308	$113,673	$469,981	$8,558	$478,539
Non-Personnel Expense							

Travel	$0	$1,000	$1,000	$1,000	$2,000	$0	$2,000
Capital	$0	$20,000	$20,000	$10,000	$30,000	-$20,000	$10,000
Library	$0	$0	$0	$0	$0	$0	$0
Current Expense	$3,000	$5,000	$8,000	$2,000	$10,000	$0	$10,000
Total Non-personnel Expense	$3,000	$26,000	$29,000	$13,000	$42,000	-$20,000	$22,000
Total Expense (Personnel + Current)	$252,588	$132,720	$385,308	$126,673	$511,981	-$11,442	$500,539
Departmental Funding							
Appropriated Fund	$252,588	$132,720	$385,308	$126,673	$511,981	-$11,442	$500,539
Other:							
Special Legislative Appropriation							
Grants and Contracts							
Special Fees/Differential Tuition							
Total Revenue	$252,588	$132,720	$385,305	$126,673	$511,981	-$11,442	$500,539
Difference							
Revenue - Expense	$0	$0	$0	$0	$0	$0	$0
Departmental Instructional Cost/Student Credit Hour* *(as reported in institutional Cost Study for "current" and using the same Cost Study Definition for "projected")*	$378		$361		$349		$341
* Projected Instructional Cost/Student Credit Hour data contained in this chart are to be used in the Third-Year Follow-Up Report and Cyclical Reviews required by R411.							

Funding Sources

1. UVU PBA institutional funds.
2. Program enrollment growth.

3. UVU process for allocating Carl Perkins Vocational and Technical Funding to the AAS portion of the program.
4. Additional funding will be sought from business and industry partners.

Reallocation

No fund reallocation is planned at this time. Funding requests will be made and prioritized via UVU's annual PBA process.

Impact on Existing Budgets

Not Applicable

Section VI: Program Curriculum

All Program Courses

Course Prefix and Number	Title	Credit Hours
General Education Requirements		38.0
CHEM 1010	Introduction to Chemistry (fulfills additional Biology or Physical Science)	3.0
ENGL 1010	Introduction to Writing	3.0
ENGL 2020	Intermediate Writing--Science and Technology	3.0
ENGL 2310	Technical Communication (fulfills Humanities Distribution)	3.0
MATH 1050	College Algebra	4.0
PHIL 2050	Ethics and Values	3.0
HIST 1700 or HIST 1740 or HIST 2700 and 2710 or POLS 1000 or POLS 1100	American Civilizations or US Economic History (recommended) or US History to 1877 and since 1877 or American Heritage or American National Government	3.0
HLTH 1100 or PES 1097	Personal Health and Wellness or Fitness for Life	2.0
PHYS 2010	College Physics I (fulfills Physical Science distribution)	4.0
PHYS 2015	College Physics I Lab	1.0
Biology	(BIOL 1010 Recommended)	3.0
Fine Arts	(ART1110 Recommended)	3.0
MGMT 1010 or ECON 1010	Introduction to Business or Economics (fulfills Social/Behavioral Science)	3.0
Discipline Core Requirements		83.0
EGDT 1071	3 Dimensional Modeling—Solidworks	3.0
IT 3400	Data Cabling Signal Characteristics	3.0
TECH 3000	Introduction to Technology Management	3.0
MECH 1010	Introduction to Mechatronics	3.0

Course Prefix and Number	Title	Credit Hours
MECH 1200	Electronics in Automation Design	5.0
MECH 1250	Logic Fundamentals for Mechatronic Design	3.0
MECH 2200	Semiconductors Used in Mechatronic Systems	4.0
MECH 2300	Microcontroller Architecture and Programming	4.0
MECH 2400	Mechanical Components	4.0
MECH 2500	Introduction to PLC's in Mechatronic Design	4.0
MECH 2510	Automation System Sensors	3.0
MECH 2550	Advanced PLC Programming and Applications	4.0
MECH 2600	Introduction to Pneumatics	3.0
MECH 3000	Wiring Diagrams in Automation Systems	3.0
MECH 3220	Automation Motors and Controllers	3.0
MECH 3300	Industrial Networks	3.0
MECH 3400	Statics and Strength of Materials	5.0
MECH 3500	Industrial Robots	3.0
MECH 3570	Design Analysis and Rapid Prototyping	3.0
MECH 4300	Advanced Pneumatic Design	3.0
MECH 3700	CNC Machines	3.0
MECH 4100	Technical Math Applied to Automation	2.0
MECH 4400	Polymers/Composites and Processes	3.0
MECH 4500	Advanced Automation Controls	3.0
MECH 4800	Capstone Project	3.0
	Sub-Total	83.0
	Total Number of Credits	121.0

Program Schedule

Fall of First Year (Course Prefix and Number)	Course Title	Credit Hours
MATH 1050	College Algebra	4
MECH 1200	Electronics in Automation Design	5
MECH 1250	Logic Fundamentals for Mechatronic Design	3
ENGL 1010	Introduction to Writing	3
	Semester total:	15.0
Spring of First Year (Course Prefix and Number)	**Course Title**	**Credit Hours**
MECH 1010	Introduction to Mechatronics	3
EGDT 1071	3 Dimensional Modeling-SolidWorks	3
MECH 2200	Semiconductors Used in Mechatronic Systems	4
MECH 2300	Microcontroller Architecture and Programming	4
ENGL 2020	Intermediate Writing-Science and Technology	3

	Semester total:	17.0
Fall of Second Year (Course Prefix and Number)	Course Title	Credit Hours
MECH 2500	Introduction to PLC's in Mechatronic Design	4
MECH 2400	Mechanical Components	4
MECH 2510	Automation System Sensors	3
MGMT 1010 or ECON 1010	Introduction to Business or Economics as a Social Science	3
HLTH 1100 or PES 1097	Personal Health and Wellness or Fitness for Life	2
	Semester total:	16.0
Spring of Second Year (Course Prefix and Number)	Course Title	Credit Hours
MECH 2600	Introduction to Pneumatics	3
MECH 2550	Advanced PLC Programming and Applications	4
PHYS 2010	College Physics I	4
PHYS 2015	College Physics I Lab	1
ENGL 2310	Technical Communication	3
	Semester total:	15.0
Fall of Third Year (Course Prefix and Number)	Course Title	Credit Hours
MECH 3000	Wiring Diagrams in Automation Systems	3
MECH 3220	Automation Motors and Controllers	3
MECH 4100	Technical Math Applied to Automation	2
Fine Arts	ART 1110 Recommended	3
American Institutions	HIST 1740 Recommended	3
	Semester total:	14.0
Spring of Third Year (Course Prefix and Number)	Course Title	Credit Hours
MECH 3500	Industrial Robots	3
MECH 3300	Industrial Networks	3
IT 3400	Data Cabling Signal Characteristics	3
MECH 3400	Statics and Strength of Materials	5
	Semester total:	14.0
Fall of Fourth Year (Course Prefix and Number)	Course Title	Credit Hours
MECH 3570	Design Analysis and Rapid Prototyping	3
MECH 4300	Advanced Pneumatic Design	3

MECH 3700	CNC Machines	3
TECH 3000	Introduction to Technology Management	3
CHEM 1010	Introduction to Chemistry	3
	Semester total:	15.0
Spring of Fourth Year (Course Prefix and Number)	Course Title	Credit Hours
MECH 4500	Advanced Automation Controls	3
MECH 4400	Polymers/Composites, and Processes	3
MECH 4800	Capstone Project	3
PHIL 2050	Ethics and Values	3
Biology	BIOL 1010 Recommended	3
	Semester total:	15.0

Section VII: Faculty

College of Technology and Computing

David P Phillips, Assistant Professor, Engineering Technology Department

- BS, Electronics Engineering Technology, Brigham Young University
- MS, Computer and Information Sciences, University of New Mexico
- 20+ years industrial experience
- 10 years teaching experience

David J. Dunlop, Assistant Professor, Engineering Technology Department

- BS, Mechanical Engineering, University of Utah
- MS, Mechanical Engineering, University of Utah
- PhD, Mechanical Engineering, University of Utah (expected completion 2015)
- 4+ years industrial experience
- 3 years teaching experience