STATE BOARD OF COMMUNITY COLLEGES

CURRICULUM PROGRAM APPLICATION *[FTFA*]*
(Existing Program)

The State Board of Community Colleges is asked to approve the curriculum program at the listed colleges on the condition that equipment funds are available to the college and operating funds generated by the budget formula will permit the offering of these program without any special allocation of funds.

Randolph Community College
Mechatronics Engineering Technology (A40350)

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Fast Track for Action

PROGRAM APPLICATION
SUMMARY EVALUATION REPORT
Randolph Community College
Mechatronics Engineering Technology (A40350)

I. Program Planning

Randolph Community College is seeking approval for the Mechatronics Engineering Technology (A40350) program to begin Fall 2013. The planning area is defined as the college's service area of Randolph County. All colleges were notified of the planning process for this program.

The proposed program was approved by the Board of Trustees at RCC on November 15, 2012. Minutes from this Board meeting were attached to the program application. The President and the Board of Trustees of RCC have certified the following:

- The proposed program will enhance the workforce of North Carolina, will provide educational and training opportunities consistent with the mission of the college, and will not duplicate the opportunities currently offered.
- They have assessed the need for the proposed program and the resources required to maintain a viable program and certify that the college can operate the proposed program efficiently and effectively within the resources available to the college.
- The college will complete a program accountability report including student success measures, enrollment trends, completion rates, and employment data three years after implementation of the program.

II. Program Rationale

Randolph Community College indicated the following**:**

- There are many manufacturing job positions involving mechatronics skill sets currently listed on Craigslist, which offers low-cost job postings to employers, in the Piedmont Triad Partnership region including Randolph County. Examples of posted employment positions are: manufacturing manager, production manager, electronics quality engineer, maintenance supervisor, service technician, PLC technician, industrial maintenance technician, maintenance mechanic, maintenance electrician, quality technician, equipment validation manger, and production technician-electrical mechanical.

- The NC Department of Commerce Division of Employment Security (DES) lists manufacturing as the largest industry sector in Randolph County with 15,484 employment positions. Additionally, there are 2,980 related employment positions listed under Installation, Maintenance, and Repair Occupations. DES estimates state growth in this occupational area in 2008-18 to increase by 10,810.

- RCC plans to teach-out Industrial Systems Technology and implement MET.

- Letters of support for the Mechatronics Engineering Technology program were submitted to RCC by several local industries including Energizer Battery Manufacturing, Energizing Holdings, and Energizer Household Products, Inc., Americhem, Hubbell Industrial Controls, and Mom Brands.

II. Impact of the Proposed Program on Other Programs

Four community colleges are approved to offer the MET program. Guilford Technical CC is the only approved college contiguous to the service area of Randolph Community College. GTCC agrees that there will be no negative impact to their program.

IV. Implementation of Collaborative Plan

Not Applicable

V. Curriculum Design

The proposed program of study is in compliance with the State Board approved curriculum standard.

Coordinator: Mr. Frank Scuiletti

C. Institutional Certification: *Complete the following form and obtain required signatures. Form with original signatures should be included in the application.*

Institutional Certification

This curriculum program **Mechatronics Engineering Technology** (*Program Title*) **A40350** (*Program Code*)

will enhance the workforce of North Carolina, will provide educational and training opportunities consistent with the mission of the college, and will not duplicate the opportunities currently offered.

Randolph Community College
(Community College Name)

has assessed the need for this program and the resources required to maintain a viable program and certifies that the college can operate this program efficiently and effectively within the resources available to the college.

The college understands that this proposed program will require a program accountability report that will include items such as student success measures, enrollment trends, completion rates, and employment data three years after implementation if the program is approved by the State Board.

(A copy of the minutes from the Board of Trustees meeting(s) where the proposed program was discussed and approved must be attached to the application.)

ATTACHMENT 3: Board of Trustee Minutes

Robert S Shackleford — 11-19-12
Signature, President of College — *Date*

Mac Stevens — 11-15-12
Signature, Board of Trustees Chair — *Date*

Curriculum Standard for Engineering and Technology: Applied, Automation, Mechatronics Engineering Technology

Career Cluster: Science, Technology, Engineering, Mathematics**

Cluster Description: Planning, managing, and providing scientific research and professional and technical services (e.g., physical science, social science, and engineering) including laboratory and testing services, and research and development services.

Pathway: Engineering and Technology | **Effective Term:** Fall 2013 (2013*03)

Program Majors Under Pathway

Program Major / Classification of Instruction Programs (CIP) Code		Credential Level(s) Offered	Program Major Code
Applied Engineering Technology	CIP Code: 15.0000	AAS/Diploma/Certificate	A40130
Automation Engineering Technology	CIP Code: 15.0406	AAS/Diploma/Certificate	A40120
Mechatronics Engineering Technology	CIP Code: 15.0403	AAS/Diploma/Certificate	A40350

Pathway Description: These curriculums are designed to prepare students through the study and application of principles from mathematics, natural sciences, and technology and applied processes based on these subjects.

Course work includes mathematics, natural sciences, engineering sciences and technology.

Graduates should qualify to obtain occupations such as technical service providers, materials and technologies testing services, process improvement technicians, engineering technicians, industrial and technology managers, or research technicians.

Program Description: Choose one of the following 4th paragraphs to use in conjunction with the first three paragraphs of the pathway description above for documentation used to identify each Program Major:

Applied Engineering Technology: A course of study that prepares the students to use basic engineering principles and technical skills to solve technical problems in various types of industry. The course work emphasizes analytical and problem-solving skills. The curriculum includes courses in safety, math, physics, electricity, engineering technology, and technology-specific specialty areas. Graduates should qualify for employment in a wide range of positions in research and development, manufacturing, sales, design, inspection, or maintenance. Employment opportunities exist in automation, computer, electrical, industrial, or mechanical engineering fields, where graduates will function as engineering technicians.

Automation Engineering Technology: A course of study that prepares the students to use basic engineering principles and technical skills to develop, install, calibrate, modify and maintain automated systems. Includes instruction in computer systems; electronics and instrumentation; programmable logic controllers (PLCs); electric, hydraulic and pneumatic control systems; actuator and sensor systems; process control; robotics; applications to specific industrial tasks. The graduates of this curriculum will be prepared for employment in industries that utilize control systems, computer hardware and software, electrical, mechanical and electromechanical devices in their automation systems.

Mechatronics Engineering Technology: A course of study that prepares the students to use basic engineering principles and technical skills in developing and testing automated, servomechanical, and other electromechanical systems. Includes instruction in prototype testing, manufacturing and operational testing, systems analysis and maintenance procedures. Graduates should be qualified for employment in industrial maintenance and manufacturing including assembly, testing, startup, troubleshooting, repair, process improvement, and control systems, and should qualify to sit for Packaging Machinery Manufacturers Institute (PMMI) mechatronics or similar industry examinations.

**Within the degree program, the institution shall include opportunities for the achievement of competence in reading, writing, oral communication, fundamental mathematical skills, and basic use of computers.*

Approved by the State Board of Community Colleges on August 16, 2012; Editorial Revision 09/08/12; Editorial Revision 12/14/12.

I. General Education Academic Core

[*Curriculum Requirements for associate degree, diploma, and certificate programs in accordance with 23 SBCCC 02E.0204(3)]*: *Degree programs must contain a minimum of 15 semester hours including at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural sciences/mathematics. Degree programs must contain a minimum of 6 semester hours of communications. Diploma programs must contain a minimum of 6 semester hours of general education; 3 semester hours must be in communications. General education is optional in certificate programs.*

Engineering and Technology: Applied, Automation and Mechatronics Engineering Technology

General Education Academic Core	**AAS**	**Diploma**	**Certificate**
Minimum General Education Hours Required:	**15 SHC**	**6 SHC**	**0 SHC**
Courses listed below are recommended general education courses for this curriculum standard. Colleges may choose to include additional or alternative general education courses to meet local curriculum needs. **Communications**:	**6 SHC**	**3-6 SHC**	**Optional**
*COM 101 Workplace Communication 3 SHC COM 110 Introduction to Communication 3 SHC COM 120 Intro Interpersonal Com 3 SHC COM 231 Public Speaking 3 SHC *ENG 101 Applied Communications I 3 SHC *ENG 102 Applied Communications II 3 SHC ENG 110 Freshman Composition 3 SHC ENG 111 Expository Writing 3 SHC ENG 114 Professional Research & Reporting 3 SHC ENG 116 Technical Report Writing 3 SHC			
Humanities/Fine Arts:	**3 SHC**	**0-3 SHC**	**Optional**
*HUM 101 Values in the Workplace 2 SHC HUM 110 Technology and Society 3 SHC HUM 115 Critical Thinking 3 SHC HUM 230 Leadership Development 3 SHC PHI 230 Introduction to Logic 3 SHC PHI 240 Introduction to Ethics 3 SHC			
Social/Behavioral Sciences:	**3 SHC**	**0-3 SHC**	**Optional**
ECO 151 Survey of Economics 3 SHC ECO 251 Prin of Microeconomics 3 SHC GEO 110 Introduction to Geography 3 SHC GEO 111 World Regional Geography 3 SHC GEO 131 Physical Geography I 4 SHC *PSY 101 Applied Psychology 3 SHC *PSY 102 Human Relations 2 SHC PSY 118 Interpersonal Psychology 3 SHC PSY 135 Group Processes 3 SHC PSY 150 General Psychology 3 SHC *SOC 105 Social Relationships 3 SHC SOC 210 Introduction to Sociology 3 SHC SOC 215 Group Process 3 SHC			
Natural Sciences/Mathematics:	**3 SHC**	**0-3 SHC**	**Optional**
MAT 120 Geometry and Trigonometry 3 SHC MAT 121 Algebra/Trigonometry I 3 SHC MAT 161 College Algebra 3 SHC MAT 171 Precalculus Algebra 3 SHC MAT 175 Precalculus 4 SHC MAT 223 Applied Calculus 3 SHC MAT 271 Calculus I 4 SHC			

II. Major Hours. AAS, diploma, and certificate programs must include courses which offer specific job knowledge and skills. Work experience, including cooperative education, practicums, and internships, may be included in associate in applied science degrees up to a maximum of 8 semester hours of credit; in diploma programs up to a maximum of 4 semester hours of credit; and in certificate programs up to a maximum of 2 semester hours of credit. Below is a description of each section under Major Hours.

A. Technical Core. The technical core is comprised of specific courses which are required for all Program Majors under this Curriculum Standard. A diploma program offered under an approved AAS program standard or a certificate which is the highest credential level awarded under an approved AAS program standard must include a minimum of 12 semester hours credit derived from the curriculum core courses or core subject area of the AAS program.

B. Program Major(s). The Program Major must include a minimum of 12 semester hours credit from required subjects and/or courses. The Program Major is in addition to the technical core.

C. Other Major Hours. Other major hours must be selected from prefixes listed on the curriculum standard. A maximum of 9 semester hours of credit may be selected from any prefix listed, with the exception of prefixes listed in the core.

Engineering and Technology: Applied, Automation, Mechatronics Engineering Technology			**AAS**	**Diploma**	**Certificate**
Minimum Major Hours Required:			**49 SHC**	**30 SHC**	**12 SHC**
*Courses required for a diploma are designated with **			**16-44 SHC**	**16-24 SHC**	
A. Technical Core:					
***Computer Applications**					
Choose one:					
CIS 110	Introduction to Computers	3 SHC			
EGR 111	Eng Comp and Careers	3 SHC			
EGR 125	Appl Software for Tech	2 SHC			
ELC 127	Software for Technicians	2 SHC			
***Safety**					
Choose one:					
ISC 112	Industrial Safety	2 SHC			
ISC 115	Construction Safety	2 SHC			
B. Program Major(s):					
For AAS Degree select one program major.					
Applied Engineering Technology					
***Computers**					
Choose one:					
DFT 119	Basic CAD	2 SHC			
ELC 127	Software for Technicians	2 SHC			
***Electricity**					
Choose one:					
ELC 131	Circuit Analysis I	4 SHC			
ELC 138	DC Circuit Analysis	4 SHC			
ELC 139	AC Circuit Analysis	4 SHC			
***Engineering**					
Choose one:					
HYD 110	Hydraulics/Pneumatics I	3 SHC			
HYD 112	Hydraulics/Med/Heavy Duty	2 SHC			
HYD 115	Industrial Hydraulics	3 SHC			
MNT 165	Mechanical Industrial Sys	2 SHC			
***Motors and Controls**					
Choose one:					

ELC 117	Motors and Controls	4 SHC			
ELC 128	Intro to PLC	3 SHC			
***Specialty**					
Choose one:					
ATR 112	Intro to Automation	3 SHC			
CET 110	Intro to CET	1 SHC			
ELN 131	Analog Electronics I	4 SHC			
ISC 129	Qual Testing Lab Tech	3 SHC			
MEC 110	Intro to CAD/CAM	2 SHC			
PCI 150	Process Control Systems	4 SHC			
Automation Engineering Technology					
*ATR 112	Intro to Automation	3 SHC			
ATR 121	Intro to Machine Vision	4 SHC			
*ATR 215	Sensors and Transducers	3 SHC			
*ELC 128	Intro to PLC	3 SHC			
ELN 133	Digital Electronics	4 SHC			
PCI 171	Fieldbus Systems	4 SHC			
***Basic Electricity**					
Choose one set:					
ELC 131	Circuit Analysis I	4 SHC			
ELC 133	Circuit Analysis II	4 SHC			
OR					
ELC 138	DC Circuit Analysis	4 SHC			
ELC 139	AC Circuit Analysis	4 SHC			
Mechatronics Engineering Technology					
*ATR 112	Intro to Automation	3 SHC			
*ELC 213	Instrumentation	4 SHC			
***Basic Electricity**					
Choose one course or set:					
ELC 111	Intro to Electricity	3 SHC			
OR					
ELC 112	DC/AC Electricity	5 SHC			
OR					
ELC 131	Circuit Analysis I	4 SHC			
OR					
ELC 138	DC Circuit Analysis	4 SHC			
ELC 139	AC Circuit Analysis	4 SHC			
Drawing					
Choose one:					
DFT 119	Basic CAD	2 SHC			
DFT 151	CAD I	3 SHC			
DFT 154	Intro Solid Modeling	3 SHC			
DFT 170	Engineering Graphics	3 SHC			
EGR 120	Eng and Design Graphics	3 SHC			
ELC 132	Electrical Drawings	2 SHC			
Fluid Mechanics					
Choose one:					
HYD 110	Hydraulics/Pneumatics I	3 SHC			
HYD 180	Pneumatics in Automation	3 SHC			
MEC 265	Fluid Mechanics	3 SHC			
Mechanical Drives					
Choose one:					
MEC 130	Mechanisms	3 SHC			
MEC 275	Engineering Mechanisms	3 SHC			
Machines					
Choose one course or set:					
ELC 117	Motors and Controls	4 SHC			
ELC 130	Advanced Motors/Controls	3 SHC			
ELC 135	Electrical Machines I	3 SHC			

AND					
ELC 136	Electrical Machines II	4 SHC			
Programmable Logic Controllers					
Choose one:					
ELC 128	Intro to PLC	3 SHC			
ELN 260	Prog Logic Controllers	4 SHC			
***Physics**					
Choose one:					
PHY 131	Physics-Mechanics	4 SHC			
PHY 151	College Physics I	4 SHC			

C. Other Major Hours. ***To be selected from the following prefixes:***

AHR, ALT, ATR, BAT, BPM, BPR, BTB, BTC, BUS, CEG, CET, CHM, CIS, CIV, COE, CSC, CTI, CTS, DBA, DDF, DEA, DFT, EGR, ELC, ELN, FBG, GRA, HET, HYD, ISC, LOG, MAC, MAT, MCM, MEC, MKT, MNT, MPS, MLG, MSM, NET, NOS, OMT, PCI, PHY, PKG, RCT, RVM, SEC, SST, TRN, WEB and WLD

Up to three semester hour credits may be selected from the following prefixes: ARA, ASL, CHI, FRE, GER, ITA, JPN, LAT, POR, RUS and SPA.

III. Other Required Hours

A college may include courses to meet graduation or local employer requirements in a certificate (0-1 SHC), diploma (0-4 SHC), or an associate in applied science (0-7 SHC) program. These curriculum courses shall be selected from the Combined Course Library and must be approved by the System Office prior to implementation. Restricted, unique, or free elective courses may not be included as other required hours.

IV. Employability Competencies

Fundamental competencies that address soft skills vital to employability, personal, and professional success are listed below. Colleges are encouraged to integrate these competencies into the curriculum by embedding appropriate student learning outcomes into one or more courses or through alternative methods.

A. Interpersonal Skills and Teamwork – The ability to work effectively with others, especially to analyze situations, establish priorities, and apply resources for solving problems or accomplishing tasks.

B. Communication – The ability to effectively exchange ideas and information with others through oral, written, or visual means.

C. Integrity and Professionalism – Workplace behaviors that relate to ethical standards, honesty, fairness, respect, responsibility, self-control, criticism and demeanor.

D. Problem-solving – The ability to identify problems and potential causes while developing and implementing practical action plans for solutions.

E. Initiative and Dependability – Workplace behaviors that relate to seeking out new responsibilities, establishing and meeting goals, completing tasks, following directions, complying with rules, and consistent reliability.

F. Information processing – The ability to acquire, evaluate, organize, manage, and interpret information.

G. Adaptability and Lifelong Learning – The ability to learn and apply new knowledge and skills and adapt to changing technologies, methods, processes, work environments, organizational structures and management practices.

H. Entrepreneurship – The knowledge and skills necessary to create opportunities and develop as an employee or self-employed business owner.

**The *North Carolina Career Clusters Guide was developed by the North Carolina Department of Public Instruction and the North Carolina Community College system to link the academic and Career and Technical Education programs at the secondary and postsecondary levels to increase student achievement. Additional information about Career Clusters is located at: http://www.nc-net.info/NC_career_clusters_guide.php or http://www.careertech.org.*

Summary of Required Semester Hour Credits (SHC) for each credential:

	AAS	**Diploma**	**Certificate**
Minimum General Education Hours	15	6	0
Minimum Major Hours	49	30	12
Other Required Hours	0-7	0-4	0-1
Total Semester Hours Credit (SHC)	**64-76**	**36-48**	**12-18**