Northeast Alabama Community College
Curriculum Committee
Minutes

May 17, 2016

Meeting: The Curriculum Committee held an online meeting on Tuesday, May 17, 2016.

Participating: Dr. Joe Burke, Haley Johnson, Jane Hopson, Dr. Mike Kennamer, Rodney Land, Greg Millican, Dean Sherie Grace, Joan Reeves, Rob Woodall, Sherry Whitten, Jody Ragsdale, Brad Fricks

Not Participating: Angie Stewart, Dr. Julia Everett, Shelia Barnes

Chair Rodney Land convened the online meeting. He asked the committee to review an *Application for Addition to the Curriculum* for ILT 235. He asked the committee to respond with a vote of yes or no to approve or disapprove the course for the summer term.

All participating members voted to approve the *Application for Addition to the Curriculum* for ILT 235.

Respectfully submitted by Olivia Dodd (secretary)
Approved by Rodney Land, chair

Northeast Alabama Community College

Application for Additions to the Curriculum

Please note that the application must be approved by the Curriculum Committee before it is presented to the Vice President/Dean of Instruction for final approval.

1. Course prefix and number: ILT 235
   Course title: Principles of Robotics Systems.

2. How does this course help achieve or enhance the Northeast Alabama Community College Mission?

   The addition of this course supports NACC goals #3 & #7 by providing instruction which will lead to the attainment of specified learning outcomes, certificates, associate degrees, or institutional awards, and employment in the field of study. It will also deliver training specifically designed to meet the needs of local business, industry, community organizations, and governmental agencies.

3. Give justification for offering this course at Northeast Alabama Community College.

   In addition to the promotion of NACC mission and goals, this course benefits the ILT program by providing a single course that provides an introductory level course in robotics.

4. Is this a transfer course?
   NO
   If so, what is the AGSC Transfer Code Designation (A, B, or C)?
   _____

5. Into what degree or certificate program(s) will this course fit?
   Industrial Electronics Technology
   Associate in Applied Science Degree and Short-Term Certificate.

6. Into what STARS area(s) will the course fit in a transfer program (Areas I-V)?
   V

7. Is this course listed in the Alabama College System Course Directory?
   YES If so, please attach a copy of the ACS directory listing.

COURSE DESCRIPTION: *This course is an overview of basic robotic systems and classifications used in industry. An emphasis is placed on safety elements particular to automation. Topics include the principles and concepts associated with robotic system components. Upon completing this course, students should be able to classify robots and explain the various components of a safe robotic system and how these components interact.*

CONTACT/CREDIT HOURS

Theory Credit Hours	3 hours
Lab Credit Hours	0 hour
Total Credit Hours	3 hours

8. Provide the course description. (see directory listing #7 above)

9. Does this course have a previously taught equivalent? If so, please list the prefix, number, title, and track number of the previous course. NO.

Submitted by Barry Wigley Date 5/16/2016
Instructor

Endorsed by SIGNATURES ON FILE

Approved by

*Approved by
Vice President/Dean of Instruction

*Final approval of any course rests with the Vice President/Dean of Instruction.

Alabama Department of Postsecondary Education

Representing the Alabama Community College System

October 6, 2009

ILT 235

Principles of Robotic Systems

Plan of Instruction

Effective Date: Fall 2010 **Version Number: 2009-1**

COURSE DESCRIPTION: This course is an overview of basic robotic systems and classifications used in industry. An emphasis is placed on safety elements particular to automation. Topics include the principles and concepts associated with robotic system components. Upon completing this course, students should be able to classify robots and explain the various components of a safe robotic system and how these components interact.

CONTACT/CREDIT HOURS

Theory Credit Hours	3 hours
Lab Credit Hours	0 hour
Total Credit Hours	3 hours

NOTE: Theory credit hours are a 1:1 contact to credit ratio. Colleges may schedule practical lab hours as 3:1 or 2:1 contact to credit ratio. Clinical hours are 3:1 contact to credit ratio. (Ref Board Policy 705.01)

PREREQUISITE COURSES

As determined by college.

CO-REQUISITE COURSES

As determined by college.

PROFESSIONAL COMPETENCIES

- Explain the interaction of components in a basic robotic system.
- Implement a robotic system safety plan.
- Differentiate among various robotic systems based on standard classification criteria and applications.

INSTRUCTIONAL GOALS

- **Cognitive** – Comprehend principles and concepts related to robotic systems.
- **Psychomotor** – Apply principles of robotic systems.
- **Affective** – Value the importance of adhering to policy and procedures related to robotic systems.

STUDENT OBJECTIVES

Condition Statement: Unless otherwise indicated, evaluation of student's attainment of objectives is based on knowledge gained from this course. Specifications may be in the form of, but not limited to, cognitive skills diagnostic instruments, manufacturer's specifications, technical orders, regulations, national and state codes, certification agencies, locally developed lab/clinical assignments, or any combination of specifications.

STUDENT LEARNING OUTCOMES

MODULE A – ROBOT SYSTEMS		
MODULE DESCRIPTION – This module covers the various components in a robotic system, their purposes, and how they interact within the system.		
PROFESSIONAL COMPETENCIES	**PERFORMANCE OBJECTIVES**	**KSA**
A1.0 Explain the interaction of components in a basic robotic system.	A1.1 Examine components in a robotic system	1
LEARNING OBJECTIVES		**KSA**
A1.1.1 List and identify basic components which comprise an industrial robot.		1
A1.1.2 Describe purpose for the basic components of a robotics system.		2
A1.1.3 Define terms associate with robot system components, including: • Controller • Manipulator • Power supply • Teach pendant • End-arm-tooling • Actuator • Program • Work envelope • Work cell • Hierarchical control • Repeatability • Accuracy • Payload • Tool center point • Position axes • Orientation axes		1

MODULE A OUTLINE:
• Basic robot components
  ○ Identification
  ○ Purposes
• Robotic terminology		

MODULE B – ROBOTIC SAFETY
MODULE DESCRIPTION – This module covers basic robotic safety awareness principles used when designing a safety strategy for an automated work cell.

PROFESSIONAL COMPETENCIES	PERFORMANCE OBJECTIVES	KSA
B1.0 Implement a robotic system safety plan.	B1.1 Implement a complete safety system for a work cell.	2
	B1.1 Perform lock-out/tag-out procedures.	2
	B1.1 Perform all safety procedure requirements for arc flash according to NFPA 70-3.	2

LEARNING OBJECTIVES		KSA
B1.1.1	List organizations which define issues associated with industrial robotics safety.	2
B1.1.2	List standards used to define safety issues associated with industrial robotics safety.	1
B1.1.3	Identify and describe NFPA 70-3, Standard for Electrical Safety in the Workplace, requirements for arc flash safety procedures.	2
B1.1.4	Identify safeguarding devices.	1
B1.1.5	Identify safeguarding hardware.	1
B1.1.6	Describe lock-out or tag-out procedures.	3
B1.1.7	Describe the procedure used to safeguard an automation work cell.	2
B1.1.8	List and identify presence sensing devices.	1
B1.1.9	Describe the operation of presence sensing devices.	2
B1.1.10	Describe the operation of presence sensing devices used in automated work cells.	2
B1.1.11	Describe interlock switch operation.	2
B1.1.12	Describe interlock positive mode operation.	2
B1.1.13	Identify forms of interlock devices.	1
B1.1.14	Calculate safe guard distance.	2
B1.1.15	Describe power interlocking.	2
B1.1.16	Describe control interlocking.	2
B1.1.17	Identify mechanical interlocking devices.	1
B1.1.18	Describe conditional and unconditional guard locking and unlocking.	2
B1.1.19	Describe the operation of power and control interlock devices used in automated work cells.	2
B1.1.20	List standards for safe guarding the operator.	2
B1.1.21	List standards for safe guarding the programmer.	2
B1.1.22	List standards for safe guarding the maintenance and repair personnel.	2
B1.1.23	List procedures used to safe guard the operator, programmer, and maintenance personnel in a work cell.	2
B1.1.24	List steps for and perform a risk assessment for a work cell.	3
B1.1.25	Identify and describe methods for hazard reduction in a work cell.	2
B1.1.26	Identify and describe personnel protection equipment.	2
B1.1.27	Develop a safety strategy for an automated work cell.	2
B1.1.28	Identify techniques for hazard control used by OSHA/ANSI.	2
B1.1.29	Implement a safety system for a work cell.	2

MODULE B OUTLINE:

- Safety organizations
- Robotic safety standards

MODULE C – ROBOTIC CLASSIFICATIONS		
MODULE DESCRIPTION – This module overviews the criteria associated with classifying robots based on the application.		
PROFESSIONAL COMPETENCIES	**PERFORMANCE OBJECTIVES**	**KSA**
C1.0 Differentiate among various robotic systems based on standard classification criteria and applications.	C1.1 Given a list of criteria, classify robots for a particular application.	2
LEARNING OBJECTIVES		**KSA**
C1.1.1 Define terms associated with robot configurations, including: • Servo robot • Non-servo robot • Closed-loop system • Open-loop system • Degrees of freedom • Wrist movements • Angular actuator • Linear actuator • Rotational traverse • Radial traverse • Vertical traverse • Trajectory • Electrical drive • Direct drive • Hydraulic drive • Pneumatic drive		1
C1.1.2 Differentiate among various robot arm geometries, including: • Arm geometry • Revolute • SCARA • Cartesian • Cylindrical • Spherical		2
C1.1.3 List advantages and disadvantages of robot configurations.		2
C1.1.4 Identify various applications of robots, including: • Welding • Material handling • General purpose		2

MODULE C OUTLINE:

- Robotic configurations
  - Terminology
  - Advantages
  - Disadvantages
- Robotic arm geometries
- Robotic applications

LEARNING OUTCOMES TABLE OF SPECIFICATIONS

The table below identifies the percentage of learning objectives for each module. **Instructors should develop sufficient numbers of test items at the appropriate level of evaluation.**

	Limited Knowledge and Proficiency 1	Moderate Knowledge and Proficiency 2	Advanced Knowledge and Proficiency 3	Superior Knowledge and Proficiency 4
Module A	67%	33%		
Module B	21%	72%	7%	
Module C	25%	75%		

Learner's Knowledge, Skills and Abilities		
Indicator	**Key Terms**	**Description**
1	Limited Knowledge and Proficiency	• Identifies basic facts and terms about the subject or competency. • Performs simple tasks associated with the competency. Needs to be told or shown how to do most tasks. • Requires close supervision.
2	Moderate Knowledge and Proficiency	• Identifies relationship of basic facts and states general principles and can determine step-by-step procedures for doing the competency. • Performs most parts of the competency. Needs help only on hardest parts. • Requires limited supervision.
3	Advanced Knowledge and Proficiency	• Analyzes facts and principles and draws conclusions about the subject to include why and when the competency must be done and why each step is needed. Can predict outcomes. • Performs all parts of the competency. Needs only a spot check of completed work. • Requires little or no direct supervision.
4	Superior Knowledge and Proficiency	• Can evaluate conditions and make appropriate decisions as related to resolving problems. • Performs competency quickly and accurately with no direct supervision and is able to instruct and supervise others.

Teaching and Learning Continuum