THE UNIVERSITY OF NORTH CAROLINA AT ASHEVILLE
FACULTY SENATE

Senate Document Number   4619S
Date of Senate Approval   04/04/19

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Statement of Faculty Senate Action:

APC Document 39 (ENGR):   **Delete ECE 301, Linear Systems;**
                                       Delete ECE 456, Mechatronics;
                                       Delete ECE 455, Industrial Robotic Systems, replacing
                                            with JEM 455, Robotics and Autonomous Systems
                                       Change prerequisite for JEM 420, Mechatronics Systems
                                            Modeling

Effective Date: Fall 2019

1a. Delete: On page 138, the entry for **ECE 301**:

> **301   Linear Systems (3)**
> Representation and analysis of linear systems using differential equations: impulse
> response and convolution, Fourier series, and Fourier and Laplace transformations
> for discrete time and continuous time signals. Emphasis on interpreting system
> descriptions in terms of transient and steady-state response. Digital signal processing.
> Prerequisite: grade of C- or better in ECE 211 and ECE 220. Fall.

1b. Delete: On 139, the entry for **ECE 456:**

> **456   Mechatronics (3)**
> The study of electro-mechanical systems controlled by microcomputer technology.
> The theory, design and construction of smart systems; closely coupled and fully
> integrated products and systems. The synergistic integration of mechanisms,
> materials, sensors, interfaces, actuators, microcomputers, controllers, and information
> technology. Pre-or corequisite: MAE 435. Fall.

Impact Statement: ECE 301 and ECE 456 have been dropped from the Mechatronics curriculum. ECE 301 was neither required, nor an elective option, so the deletion of the course from the catalog will have no impact. Students will take JEM 420 instead of ECE 456, so the required credit hours will not change.

Rationale: ECE 301, Linear Systems, was replaced as a required course by ECE 306, Introduction to Embedded Systems, in a previous curriculum revision. ECE 456 is being replaced by JEM 420 as a required course in the curriculum.

2.   Delete: On page 138, the entry for, **ECE 455**:

> **455   Industrial Robotic Systems (3)**
> Techniques of computer control of industrial robots. Interfacing with synchronous
> hardware including analog/digital and digital/analog converters, interfacing noise
> problems, control of electric and hydraulic actuators, kinematics and kinetics of
> robots, path control, force control, sensing including vision. Major design project.
> Prerequisite: MAE 435. Spring.

3. Add: On page 139, entry for new course, **JEM 455**:

> **455 Robotics and Autonomous Systems (3)**
> Control techniques for robotic and autonomous systems. Key methodologies and technologies including advanced robot control, robot coordination and cooperation, sensing, state estimation, motion planning, and design of sensors and actuators. Applications in specific robotic areas including industrial robots, aerial, ground, and marine robots. Pre- or corequisite: MAE 435. Fall.

Impact Statement: ECE 455, Industrial Robotic Systems, will be dropped from the Mechatronics curriculum as an adviser approved elective. It will be replaced by JEM 455, Robotics and Autonomous Systems with no associated change in total credits. JEM 455 will be taught live on the UNC Asheville campus by faculty with academic credentials at NC State University, College of Engineering.

JEM 455 replaces ECE 455 which was an advised elective. ECE 455 was a distance education class from NC State which required a facilitator on the UNCA campus. JEM 455 will be taught live on the UNCA campus by an Asheville-based faculty member. JEM 455 is not an LAC course.

The course fulfills a major requirement as an adviser-approved engineering elective. The anticipated class size is 35. The class will require scheduled class time of 150 minutes per week in lecture format. No special space or materials are required other than a smart classroom. It is anticipated the class will be offered every year in the fall semester. One faculty member will teach the class.

Upon the successful completion of the course, the student will be able to:
- Recognize and discuss the various elements that constitute a robotic system.
- Explain the applications of robotic systems as they are currently used for commercial and research purposes.
- Perform the analysis of robotic systems regarding kinematics, kinetics, sensing, and control.
- Model robotic systems.
- Analyze their performance through running simulations with the MATLAB/Simulink software.
- Make a reasoned judgment in selecting an appropriate robotic system for a given application.
- Recognize and design within the limitations of such a system.
- Apply and demonstrate their knowledge of robotic systems through undertaking Simulink projects.

Rationale: The content of ECE 455, Industrial Robotic Systems, is considered relevant and pertinent to the joint JEM curriculum, but the focus of the class could be better tuned to the needs of the local students with a mechatronics-based approach. The new course, JEM 455, Robotics and Autonomous Systems, will have a mechatronics-based approach and will provide a valuable curriculum option for students interested in a robotics and automation path in their career.

4. Delete: On page 139, the prerequisite for **JEM 420**:

> Prerequisite: ECE 306; MAE 315, 435.

Add: On page 139, in place of deleted entry:

> Pre- or corequisite: MAE 315.

Impact Statement: The change in the prerequisite for JEM 420, Mechatronics Systems Modeling, will allow students to take the course earlier, and should have no negative impact.

Rationale: The change in the prerequisites will clarify and streamline the requirement. The modification is a result of a revision of the course syllabus and content. The lab portion of the course is being removed and the assignments are being incorporated as class projects (not lab-based). ECE 306 and MAE 435 are no longer required for students to be successful in JEM 420.