



EXCITING ELECTIVES! OFFERED BY ECE PROGRAM – SPRING 2020

Multi-Disciplinary Engineering Electives – Spring 2020

Note – Seats have been reserved for CS students in a number of elective offering.

1. EE 366 – Introduction to Robotics

Robotics is a multi-disciplinary area involving ideas from mechanical engineering, electrical and computer engineering, and computer science. With the ever increasing processing power, increasing connectedness, developments in AI, robots will play an increasingly greater role in our society. Even today, robots are being deployed in the fields of agriculture, healthcare, service industry, transport, logistics, and manufacturing. Thus, courses in robotics should be offered at undergraduate level to keep our graduates at pace with the changing dynamics of industry landscape.

This course is a breadth-first course designed to be the first course in the series of robotics courses. The goal of the course is to acclimatize the students with the area of robotics and to get them started on building robots. This is accomplished by presenting foundational knowledge from the fields of mechanical engineering, electrical and computer engineering, and computer science that is pertinent to robotics.

Credit Hours: 4 (3 + 1), **Pre-requisite:** Linear Algebra

Note: This course is an elective course for EE, CE, and CS majors. This is first course in the series of Robotics courses.

Note: 10 seats have been reserved for CS students to meet their free elective requirement.

2. ENVS 301 – Intro. to Environmental Engineering

Environmental problems represent one of the gravest global challenges of the 21st century. Engineering sustainable solutions to these environmental issues is one of our most pressing needs. In this course, students will learn fundamental science and engineering principles needed for environmental engineering. Students will apply these principles to problems such as water supply and treatment systems, sewage treatment of municipal and industrial wastewaters, stream and air pollution, and disposal of solid waste materials. In addition, this course will provide an overview of major themes in contemporary environmental engineering, including environmental impacts of socioeconomic changes, energy consumption and production, water supply and treatment, air pollution and global climate change.

This course is designed to help students develop an informed opinion on the relative spatial scales and magnitudes of global and local environmental

challenges. They will gain skills to devise solutions to some of these environmental challenges. Since the course is designed for STEM students, it will also open another field of application for the skills/knowledge they have gained in EE & CS courses.

Credit Hours: 3 (3 + 0), **Pre-requisite:** Engineering Math

Note: 8 seats have been reserved for CS students to meet their free elective requirement.

3. EE 427 – Cellular Internet of Things in 5G

This course is designed to introduce and deepen student's understanding on the essentials of Internet of Things (IoT) Devices communicating with and without being attached to the cellular Networks, specifically with the Fifth Generation (5G) Cellular Networks. Moreover, dealing with IoT devices as the terminals, would expose students to the entire stack of protocols i.e from Physical to the Application layer. Thus, the course could also be foreseen to reinforce some core concepts about Network access methods resulting in another essential part of the course thematically aligned with EE-424 Data Communications and Networking Coursework, where the OSI model is covered in very generic terms. In cellular communications the IoT devices have popularly been reported to be undertaking Machine Type Communications (MTC) includes all possible scenarios of communications like Machine-to-Machine (M2M), Human-to-Machine (H2M) and Machine-to-Human (M2H).

To meet the above aspirations, this course is planned to make students walk through the fundamentals of cellular communications, Access technologies (LTE and NR), architectural evolution till 5G. To attend the core aspiration of the course proposed, Students will be learning about the details on MTC specifically from LTE Narrow Band –IoT considered as one example of the licensed Cellular IoT and LoRAWAN as an example of unlicensed IoT network.

The course is aimed to inculcate a deep understanding about the Cellular Internet of things (IoT) Networks, lay the foundation of Machine Type Communications (MTC) by framing different IoT scenarios and expose students to evolution of MTC into a massive MTC use case for 5G

Credit Hours: 4 (3 + 1),

Pre-requisite: Analog & Digital Comm. Recommended.

Note: 4 seats have been reserved for CS students to meet their free elective requirement.



4. EE 422– Embedded Systems

The huge computers of old times are now replaced by literally millions of much smaller handheld computers powered by embedded processors. These embedded processors are part of many electrical appliances used at home in various industries, medical and military applications. They have got huge market worldwide. It is essential for the graduates of ECE & CS to develop their skills in this area and to compete with the world market. This course will help them to acquire an up-to date knowledge in this field.

The basic aim of this course is to make students be able to demonstrate their abilities to design and develop an embedded system-on-chip. The goal is to introduce students a hardware description language (HDL) which they can use to develop embedded hardware on Field Programmable Gate Array (FPGA) chips. Furthermore, they will be introduced with the architecture of an ARM Cortex processor and how a software and hardware communicate at embedded level. This understanding can help the graduates of ECE/CS to become a part of a team of design engineers and developers of embedded applications in any organization.

Credit Hours: 4 (3 + 1),

Pre-requisite: DLD

Note: 6 seats have been reserved for CS students to meet their free elective requirement.

5. EE 202 – Engineering Design & Innovation

It has been said that engineers are people who can design effective solutions to meet social needs, and we would all readily agree that a significant portion of an engineer's time will be spend on design. While the students have already experienced the design process in the course of their various design projects, it is argued that studying the thought processes that lead to successful synthesis or design is critical to improving design methodologies. This course aims to present and This course aims to cultivate skills needed to produce great designs, be a more effective engineer, and communicate with high emotional and intellectual impact. This is a project-based course and students are expected to develop a solution to their identified problem by the end of semester. During the course of the semester, students will study and apply techniques suited for various steps of the design process. Students will come to appreciate that a design problem involves multiple stakeholders, come to terms with the ambiguity that shows up in design problems, make decisions in presence of multiple conflicting objectives and

constraints, handle uncertainty, think as part of a team, learn how to manage the progress of their project, and communicate their design effectively.

Credit Hours: 4 (2 + 2),

Pre-requisites: None

Note: 10 seats have been reserved for CS students to meet their free elective requirement.

6. EE 365 – Industrial Instrumentation & Automation

The ability to sense and measure, is vital to comprehension of the physical world in which we live. A great many of the instruments used for obtaining measurements in various kinds of physical systems are electrical in nature and electrical instrumentation has increased at an extraordinary rate during the past couple of decades. In this course, students will learn measurement techniques applied to instruments used both in Laboratory and Industry with more focus on fundamentals principles which are key to modern day instrumentation.

This course will introduce the function, operation, and application of common electrical/electronic instruments, measurement principles, and statistical analysis. Students will investigate the fundamental limitations of data acquisition systems and recognize and predict aliasing and quantization errors associated with the digital representation of analog signals

Credit Hours: 3 (3 +0), **Pre-requisite:** None

Note: 5 seats have been reserved for CS students to meet their free elective requirement.

7. MGMT 321 – Engineering Project Management

In professional life, our career is mapped with the success of projects assigned. As we grow, we all become managers and need to manage projects and resources. It is imperative to take project management seriously and learn skills and tools to make our life better. Even in our daily life, if we consider any “activity” as a “project”, we take it more seriously and execute it in an organized professional way thus concluding it with much better results.

This course will cover the fundamentals of project frameworks including product life cycle, processes and tools to successfully accomplish a project. The course is tailored to PMBOK best practices to gear up students for becoming a professional PM. The course covers both hard and soft skills important for project management.

Credit Hours: 3 (3 + 0), **Prerequisite:** None

Note: 5 seats have been reserved for CS students to meet their free elective requirement.