

**FACULTY SENATE – NOVEMBER 8, 2012
MEETING
UNIVERSITY CURRICULUM COMMITTEE
REPORT #2**

The University Curriculum Committee (UCC) was asked to consider a proposal for a Certificate Program in Data Center Design from the College of Engineering (CoE).

The committee completed its review of the certificate program and provides the following information for consideration.

Background Information

The CoE was approached by the National Security Agency (NSA) about recruiting CoE graduates to participate in designing and maintaining data centers. The proposal for a certificate program grew out of these discussions. There are more than half a million data centers in the U.S., and the number of centers is expected to grow. Since submitting the proposal, CoE has been contacted by another organization in San Antonio about similar needs.

Those participating in this certificate program will have the opportunity to participate in internships, receive tuition reimbursement, and obtain employment with NSA upon graduation.

Certificate Requirements

The certificate is offered to students in three engineering disciplines (Civil Engineering, Electrical Engineering, and Mechanical Engineering). Students in each of these disciplines will complete all of the required courses for their discipline, and in addition, they will take selected courses in one of the other engineering majors. To complete the certificate all students are required to take EGR 4953 (Special Studies in Engineering: Overview of Data Center Design and Operations).

Appendix A provides the list of courses needed for the certificate by discipline major. For mechanical engineering majors, their requirement would be 15 SCHs (12 hours listed under Option A and EGR 4953). For civil engineering majors, total additional hours would be 21 (18 hours listed under Option B and EGR 5953). For the electrical engineering majors, the requirement is 18 hours (15 hours listed under Option C and EGR 4953).

Demand

Although the proposal indicates that the number of students expected to participate annually is ten, due to the expected growth in these data centers, this may change. For those students participating in this certificate program they will be afforded the opportunity to participate in collaborative design of the centers.

The UCC recommends that the Certificate Program in Data Center Design be approved.

APPENDIX A

OPTION A (for ME graduates)

- **CE 3113 Structural Analysis**, 3 hours credit. Prerequisites: CE 3103 or equivalent. Forces and deflections in structural systems; considers stationary and moving loads and exact and approximate methods.
- **CE 3213 Reinforced Concrete Design**, 3 hours credit. Prerequisites or concurrent enrollment: CE 3113 and CE 3243 or equivalent. Ultimate strength theory and design for reinforced concrete members.
- **EE 3413 Analysis and Design of Control Systems**, 3 hours credit. Prerequisites: EGR 2513 and EE 2213. Modeling, analysis and design of linear automatic control systems; time and frequency domain techniques; stability analysis, state variable techniques, and other topics. Control systems analysis and design software will be used. One hour of problem solving recitation per week.
- **EE 4953 Power Electronics (2-3)** 3 hours credit. Pre-requisites: EE 3413 and permission from instructor. Operation of de-de converters, ac-dc rectifiers and dc-ac inverters. (Introduction to Power Electronics and its applications; DC-DC Converters- Basic topologies, buck, boost, buck-boost, isolated converters, forward, flyback, full-bridge, DC steady-state analysis and dynamics; Soft-switching operation- ZVS, ZCS, synchronous buck ZVS converter; AC-DC rectifiers and power factor correction – Diode rectifier, harmonics, THD, Boost power factor corrector, average current control; DC-AC inverters – Sine PWM, Space vector PWM & application in motor drives; Magnetics design – Magnetic circuits, transformer and inductor design ; Applications in renewable energy systems and smart grid; and a hardware laboratory on power electronic circuits).

OPTION B (For CE graduates)

- **ME 3293 Thermodynamics I**, (3-0) 3 hours credit. Prerequisites: EGR 2103 and EGR 2513
Heat, work, equations of state, thermodynamics systems, control volume, first and second laws of thermodynamics, applications of the laws of thermodynamics, reversible and irreversible processes, and introduction to basic thermodynamic cycles.
- **ME 4293 Thermodynamics II**, (3-0) 3 hours credit. Prerequisites: EGR 3323 and ME 3293
Energy and availability analysis, reactive and nonreactive mixtures, moist air properties, psychometric systems and analysis, vapor and gas power cycles, refrigeration and heat-pump cycles, thermodynamic relations, and chemical equilibria.
- **ME 4313 Heat Transfer**, (3-0) 3 hours credit. Prerequisites: EGR 3323, ME 3663 and ME 4293
Generalized potential distribution and gradients, transient and steady heat transfer including conduction, forced and free convection, radiation, thermal boundary layers.
- **EE 2213 Electric Circuits and Electronics**, (3-0) 3 hour credit. Prerequisites: PHY1923 and EGR2323
Electric, magnetic, and electronic circuits; transient analysis, transforms, and phasors; transformers; solid state devices; analog and digital circuits.
- **EE 3413 Analysis and Design of Control Systems**, 3 hours credit. Prerequisites: EGR 2513 and EE 2213
Modeling, analysis and design of linear automatic control systems; time and frequency domain techniques; stability analysis, state variable techniques, and other topics. Control systems analysis and design software will be used. One hour of problem solving recitation per week.
- **EE 4953 Power Electronics** (2-3) 3 hours credit. Pre-req: EE 3413 and permission from instructor.
Operation of de-de converters, ac-dc rectifiers and dc-ac inverters. (Introduction to Power Electronics and its applications; DC-DC Converters – Basic topologies, buck, boost, buck-boost, isolated converters, forward, flyback, full-bridge, DC steady-state analysis and dynamics; Soft-switching operation- ZVS, ZCS, synchronous buck ZVS converter; AC-DC rectifiers and power factor correction – Diode rectifier, harmonics, THD, Boost power factor corrector, average current control; DC-AC inverters – Sine PWM, Space vector PWM & application in motor drives; Magnetics design – Magnetic circuits, transformer and inductor design ; Applications in renewable energy systems and smart grid; and a hardware laboratory on power electronic circuits).

**OPTION C (For EE
graduates)**

- **ME 3293 Thermodynamics I**, (3-0) 3 hours credit. Prerequisites: EGR 2213
Heat, work, equations of state, thermodynamics systems, control volume, first and second laws of thermodynamics, applications of the laws of thermodynamics, reversible and irreversible processes, and introduction to basic thermodynamic cycles.
- **ME 3663 Fluid Mechanics**, (3-0) 3 hours credit. Prerequisites: EGR 2213, EGR 3323, ME 2173 (or equivalent) and ME 3293
Fluid properties, fluid statics, integral and differential analysis of fluid flow, viscous laminar and turbulent flow in conduits, dimensional analysis, boundary layer concepts, drag and lift.
- **ME 4293 Thermodynamics II**, (3-0) 3 hours credit. Prerequisites: EGR 3323 and ME 3293
Energy and availability analysis, reactive and nonreactive mixtures, moist air properties, psychometric systems and analysis, vapor and gas power cycles, refrigeration and heat- pump cycles, thermodynamic relations, and chemical equilibria.
- **ME 4313 Heat Transfer**, (3-0) 3 hours credit. Prerequisites: EGR 3323, ME 3663 and ME 4293
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