Electrical and Computer Engineering

Chair and Professor: Chiu

Professors: Stuffle

Associate Professors: Ellis, Kantabutra

Assistant Professors: Chrysler, Fouda

Visiting Professor: Baldwin

Master of Science in Measurement and Control Engineering

The master's degree program in Measurement and Control Engineering is designed to provide advanced study (analytically, computationally, and experimentally) in measurements, modeling, simulation, robotics, and adaptive, intelligent, nonlinear, optimal, and robust control. This program prepares the student for advanced placement in the measurement and control engineering field in industry, research, or development areas. Additionally, this program provides a suitable base for entrance into a doctoral program in a field related to electrical or mechanical engineering. The program is offered both at the Pocatello and the Idaho Falls campuses, primarily through the use of telecommunications/distance learning, which includes partial in-class instruction.

Goals

- Enhance the knowledge of graduates in advanced concepts of measurement, control, signal processing, engineering mathematics, computation, and other related areas.
- Increase the ability of graduates to synthesize and apply these advanced concepts to develop realistic measurement and control engineering designs and to solve identified problems, designing strategies for implementing them safely, ethically, and effectively.
- Enhance the ability of graduates to effectively communicate these concepts both in oral and written formats.

Master of Science in Measurement and Control Engineering

Admission Requirements

The student must meet all criteria for admission and then apply to the Graduate School. In addition, official Graduate School record Examination (GRE) score reports are required for all applicants, with a score equal or above the upper 65th percentile on the Quantitative Reasoning area being required for admission.

General Requirements

With the assistance of the Mechanical Engineering and/or Electrical Engineering faculty, the student shall select an initial advisor during the first semester of residence to help in planning a program of studies and research. The student must also complete a Plan of Study and form a complete advisory committee by the time six credits of course work have been completed.

30 credit hours are required to complete the M.S. degree (at least 50% of the credits should be at the 6600 level). Approximately half of the credits are engineering and technical electives, subject to the approval of the student's advisory committee. The Thesis or Special Project should consist of study and research that complements the course work selected.

Required Courses (30 credits)

The following courses are required of every student receiving the master's degree in Measurement and Control Engineering covered by the abbreviated list.

Code	Title	Credits
MATH 5521	Advanced Engineering Mathematics I	3
MCE 6642	Advanced Control Systems	3
MCE 6643	Advanced Measurement Methods	3
Approved Engineering Electives		6
Approved Technical Electives		9
ENGR 6650	Thesis	6
OR		
One additional elective course		
AND		
ME 6660	Special Project [1]	

[1] Students desiring to do the non-thesis option must have a minimum of two years industry experience. In place of the 6-credit thesis, the non-thesis option consists of a 3-credit Special Project in addition to a 3-credit course. At the completion of the Special Project, the student will be required to present an oral presentation/ defense of the Project.

Courses

EE 5513 Techniques of Computer-Aided Circuit Analysis and Design: 3 semester hours.
Automatic formulation of equations and fundamental programming techniques pertinent to computer-aided circuit analysis, design, modeling. May include sensitivity calculations, system analogies, optimization. PREREQ: EE 3340 and EE 3342.

EE 5516 Applied Engineering Methods: 3 semester hours.
Applied discrete and continuous probability, random variables, probability distributions, sampling, data description, parameter estimation, hypothesis testing, inference, correlation and linear and multiple regression. P

EE 5517 Probabilistic Signals and Systems: 3 semester hours.
Introductory probability theory. Density functions, moments, random variables. Normal, exponential distributions. Estimation of mean and variance. Correlation, spectral density. Random processes, response of linear systems to random. PREREQ: EE 3345.

EE 5518 Communication Systems: 3 semester hours.
Basic principles of analysis and design of modern analog and digital communication systems, including transmission and reception. PREREQ: EE 3329 and EE 3345.

EE 5525 Mechatronics: 3 semester hours.
Basic kinematics, sensors, actuators, measurements, electronics, microprocessors, programmable logic controllers, feedback control, robotics and intelligent manufacturing. Equivalent to ME 5525. PREREQ: MATH 3360, EE 3342, and EE 3340.

EE 5526 Computer Architecture and Organization: 3 semester hours.
Design, implementation, and performance evaluation of modern computer systems; instruction sets; datapath and control optimizations; single-cycle, multiple-cycle, and pipelined processors; hazard detection and resolution; memory hierarchies; peripheral devices. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. PREREQ: EE 2274 and EE 2275 or equivalent.

EE 5527 Embedded Systems Engineering: 2 semester hours.
Integration of algorithms, software and hardware to design real-time and embedded systems for signal processing and control. PREREQ: CS 4475 or CS 5575. COREQ: EE 5572L.

EE 5527L Embedded Systems Engineering Laboratory: 1 semester hour.
Lab activities include the complete process of design and implementation of embedded signal processing and control systems through the integration of algorithms, software, and hardware. COREQ: EE 5527.

EE 5529 Advanced Electronics: 2 semester hours.
Introduction to operational amplifiers and their applications, current mirrors, active loads, differential amplifiers, feedback and stability, filters, oscillators, Schmitt triggers, power amplifiers and voltage regulators. COREQ: EE 5529L. PREREQ: EE 3329 and EE 3345.

EE 5529L Advanced Electronics Laboratory: 1 semester hour.
Laboratory course emphasizing transistor biasing, amplifiers and other basic analog circuit designs. COREQ: EE 5529.

EE 5532 Introduction to VLSI Design: 3 semester hours.
Photolithography, CMOS fabrication, MOSFET operation, CMOS passive elements, design rules and layout, CAD tools for IC design, invertors, static logic and transmission gates, dynamic logic. PREREQ: EE 3329.

EE 5533 Mixed Signal Design: 3 semester hours.
Analog IC design. Passive components, parasitic elements, component matching, IC layout techniques, amplifiers, current sources, comparators, op amps, noise, switched capacitor circuits. Includes lab work using design tools. PREREQ: EE 4432 or EE 5532.

EE 5572 Electrical Machines and Power: 3 semester hours.
Theory and application of electrical machinery and transformers. Power and energy relationships in power systems. Includes 1 credit lab component. COREQ: EE 5572L. PREREQ: EE 3340, EE 3342, and MATH 3360.

EE 5572L Electrical Machines and Power Laboratory: 1 semester hour.
Laboratory course emphasizing an experimental study of the fundamental physical phenomena and characteristics of transformers, induction motors, synchronous and direct current machines. COREQ: EE 5572.

EE 5573 Automatic Control Systems: 3 semester hours.
Study of continuous-time and control systems using both frequency-domain and state-space techniques; topics include design methodology, performance specifications, analysis and design techniques. PREREQ: EE 3345, ME 5505 or ME 4405.

EE 5574 Advanced Circuit Theory: 3 semester hours.
Methods of analog electrical circuit analysis and synthesis. Topics include signal flow graphs, multi-port networks, simulation techniques, and topological methods for formulation of network equations. PREREQ: EE 3340.

EE 5575 Digital Signal Processing: 3 semester hours.
Discrete, fast Fourier and Z-transforms, correlation, convolution, finite and infinite impulse response digital filter design, spectral analysis and adaptive digital filters. COREQ: EE 4484 or EE 5584. PREREQ: EE 3345.

EE 5576 Semiconductor Processing and Fabrication: 3 semester hours.
Silicon semiconductor processing and basic integrated circuit fabrication. Physics, chemistry, and technology in basic processing steps in production of integrated circuits. PREREQ: PHYS 2211, PHYS 2212, and MATH 1170 or equivalent.

EE 5578 Semiconductor Devices: 3 semester hours.
Operating principles of basic building blocks of modern silicon-based semiconductor devices to include p-n junctions, field effect transistors and bipolar junction transistors. PREREQ: PHYS 2212 or equivalent.

EE 5579 Advanced Semiconductor Devices: 3 semester hours.
Review of semiconductor band theory. Opto-electronics, quantum mechanics, hetero junctions, power and microwave semiconductor devices. PREREQ: EE 5578 or equivalent.

EE 5582 Principles of Power Electronics: 3 semester hours.
Introduction to steady state converter modeling and analysis. Principles of converter dynamics and control including controller design. COREQ: EE 5573. PREREQ: EE 3329.

EE 5584 Signal Processing Laboratory: 1 semester hour.
Design finite and infinite response digital filters in digital signal processing system applications. COREQ: EE 5575.

EE 5592 Digital Control Systems: 3 semester hours.
Design of advanced control algorithms topics include: observers and state estimation, linear quadratic regulator, frequency-domain techniques for robust control, and an introduction to multivariable and nonlinear control. PREREQ: EE 5573 or EE 4473.

EE 5599 Experimental Course: 1-6 semester hours.
The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

EE 6699 Experimental Course: 1-6 semester hours.
The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

EE 8850 Doctoral Dissertation: 1-24 semester hours.
Research toward completion of the dissertation for the Ph.D. in Engineering and Applied Science. Variable credits. May be repeated. Graded S/U.