### Finalized SLOs for Electrical Engineering Core Courses

#### EAC Criterion 3 Outcomes Supported:

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EECS 1010 FIRST YEAR DESIGN

STUDENT LEARNING OBJECTIVES

The student will be able to…
1. ......

EAC OUTCOMES SUPPORTED

Outcome
Supported by SLOs

COMMITTEE MEMBERS

Dr. Molyet (chair)
Dr. Kang
Dr. Carvalho

APPROVAL DATE

Version: 10 June 2010
EECS 1100 DIGITAL LOGIC DESIGN

STUDENT LEARNING OBJECTIVES

The student will be able to…
   1. ……

EAC OUTCOMES SUPPORTED

Outcome Supported by SLOs

COMMITTEE MEMBERS

Dr. Jamali (chair)
Dr. Molyet
Mr. Nowlin
Dr. Kaur

APPROVAL DATE

Version: 10 June 2010
EECS 1530 INTRODUCTION TO PROGRAMMING

STUDENT LEARNING OBJECTIVES

The student will be able to…

2. Implement an elementary algorithm by writing a program in the C++ language.
3. Understand the concept of a variable and the assignment operator.
4. Understand simple data types.
5. Understand the array data structure.
6. Ability to write programmer-defined functions.
7. Ability to program using branching statements.
8. Ability to program using looping statements.
9. Implement a program illustrating the fundamental concepts of the object-oriented paradigm.

EAC OUTCOMES SUPPORTED

Outcome k
Supported by SLOs 1 through 8

COMMITTEE MEMBERS

Dr. Salari (chair)
Dr. Molyet
Dr. Standley

APPROVAL DATE

March 25, 2010
EECS 2000 EECS PROFESSIONAL DEVELOPMENT

STUDENT LEARNING OBJECTIVES

The student will be able to…
1. ......

EAC OUTCOMES SUPPORTED

Outcome
Supported by SLOs

COMMITTEE MEMBERS

Dr. Heuring (chair)
Dr. Thomas
Dr. Alam

APPROVAL DATE

Version: 10 June 2010
EECS 2100 COMPUTER ORGANIZATION AND ASSEMBLY PROGRAMMING

STUDENT LEARNING OBJECTIVES

The student will be able to…
1. …...

EAC OUTCOMES SUPPORTED

Outcome
Supported by SLOs

COMMITTEE MEMBERS

Dr. Heuring (chair)
Mr. Nowlin
Dr. Kaur
Dr. Jamali

APPROVAL DATE

Version: 10 June 2010
EECS 2300 ELECTRIC CIRCUITS

STUDENT LEARNING OBJECTIVES

The student will be able to...

1. Define voltage, current, energy and power in the context of an electric circuit
2. Define the terminal behavior of the basic linear circuit elements
3. Apply Kirchoff's laws to nodal and mesh analysis of a circuit
4. Apply Thevenin's and Norton's theorems to circuit analysis
5. Apply the voltage divider, current divider, superposition, and maximum-power transfer theorems to circuit analysis
6. Perform AC steady state circuit analysis using phasors
7. Calculate complex power in an AC system
8. Do transient analysis of first order circuits
10. Recognize physical circuit elements in the lab and assemble a circuit from a schematic diagram
11. Experimentally measure voltage, current and power
12. Produce a written lab report in a standard format, which includes a brief discussion of relevant theory

EAC OUTCOMES SUPPORTED

Outcome a  
Supported by SLOs 1 through 9
Outcome e  
Supported by SLOs 10 and 11
Outcome g  
Supported by SLO 12

COMMITTEE MEMBERS

Dr. King (chair)  
Mr. Nowlin  
Dr. Shenai

APPROVAL DATE

April 20, 2010
EECS 3100 MICROSYSTEM DESIGN

STUDENT LEARNING OBJECTIVES

The student will be able to…

1. Describe the meaning of an embedded system, the reasons for the importance of embedded systems, and how computer engineering uses or benefits from embedded systems.
2. Understand how assembly language programs convert into executable code through assembler, linker, locator, and loader for an embedded system environment.
3. Write assembly code for an embedded system to function as system kernel, to perform setup, initialization, and built-in system testing.
4. Understand role of modern computer engineering hardware and software tools in system development and how to use these tools to support the design methodology.
5. Develop an understanding of the differences between a microprocessor and a microcontroller in regards to the hardware/software interface for communication with external devices.
6. Design a memory subsystem with both read-only memory and random-access memory for a microprocessor, develop read-only memory compliant random-access memory testing program in relevant assembly language, and program read-only memory with the memory testing program.
7. Design an interface for a programmable input/output device such as universal synchronous-asynchronous receiver-transmitter and develop the device driver code in assembly/machine language.
8. Design an interface for a programmable interrupt controller and develop the code for device drivers in assembly/machine language.
9. Prototype a minimal system complete with microprocessor, both read-only and random-access memory, read-only memory resident random-access memory testing program, and system startup code developed in assembly or machine language.

EAC OUTCOMES SUPPORTED

Outcome a
Supported by SLOs 3, 4, and 5
Outcome c
Supported by SLOs 6, 7, and 8
Outcome k
Supported by SLOs 2 and 9

COMMITTEE MEMBERS

Dr. Kaur (chair)
Dr. Serpen
Mr. Nowlin

APPROVAL DATE

April 08, 2010

Version: 10 June 2010
The student will be able to…

1. Represent and classify signals and systems.
2. Represent and apply singularity functions.
3. Obtain the response of a continuous, linear, time-invariant, causal system by using convolution.
4. Obtain the Fourier series expansion of a periodic signal and apply it to continuous, linear, time-invariant systems.
5. Obtain and plot the Fourier transform for simple aperiodic continuous-time signals.
6. Utilize the Laplace transform method to solve continuous, linear, time-invariant systems and to obtain transfer functions.
7. Analyze continuous, linear time-invariant systems using state variable formulation and solve the resulting state equations.
8. Convert a continuous-time signal to the discrete-time domain and reconstruct it using the sampling theorem.
9. Utilize the z-transform method to solve linear discrete-time systems and to obtain transfer functions.
10. Use MATLAB software to implement the signal processing and system analysis techniques taught in the course.

EAC OUTCOMES SUPPORTED

Outcome a
Supported by SLOs 1 through 9
Outcome k
Supported by SLO 10

COMMITTEE MEMBERS

Dr. Salari (chair)
Dr. Kaur
Dr. Kang

APPROVAL DATE

March 26, 2010
EECS 3300 PROBABILISTIC METHODS FOR ENGINEERING

STUDENT LEARNING OBJECTIVES

The student will be able to…

1. …..

EAC OUTCOMES SUPPORTED

Outcome
Supported by SLOs

COMMITTEE MEMBERS

Dr. Heuring (chair)
Dr. Salari
Dr. Kim

APPROVAL DATE
EECS 3400 ELECTRONICS I

STUDENT LEARNING OBJECTIVES

The student will be able to…
1. …..

EAC OUTCOMES SUPPORTED

Outcome
Supported by SLOs

COMMITTEE MEMBERS

Dr. Johnson (chair)
Dr. King
Dr. Kang
Dr. Jha

APPROVAL DATE
EECS 3420 ELECTRONICS II

STUDENT LEARNING OBJECTIVES

The student will be able to…

1. Produce useful incremental models for MOSFET’s and BJT’s at midband and high frequency.
2. Describe the properties of four basic analog amplifier topologies (CE, CB, CC, and differential pair).
3. Produce useful incremental models for broadband analog amplifiers in their midband, low-frequency, and high-frequency regions.
4. Calculate amplifier transfer functions, and input and output resistances.
5. Calculate, interpret and communicate the low- and high-frequency response behaviors of broadband amplifiers using Bode plots and suitable approximations.
6. Characterize the effects of midband negative feedback on broadband amplifiers at the system (block diagram) level.
7. Identify and model the midband effects, including impedance modification, of series-series, shunt-shunt, shunt-series, and series-shunt negative feedback on broadband amplifiers.
8. Succinctly state the basic concepts of the course using one or two sentences per concept.

EAC OUTCOMES SUPPORTED

Outcome a
Supported by SLOs 1, 3, 4, 5, and 7
Outcome e
Supported by SLOs 2, 5, 6, and 8
Outcome k
Supported by SLOs 5, 6, and 7

COMMITTEE MEMBERS

Dr. King (chair)
Dr. Jha
Dr. Johnson
Dr. Shenai

APPROVAL DATE

April 23, 2010
The student will be able to…
1. Experimentally measure incremental gains and resistances of analog amplifiers at midband
2. Experimentally measure and plot frequency response curves of analog amplifiers
3. Produce a written lab report in a standard format, which includes a brief discussion of relevant theory
4. Make meaningful evaluations of the degree of experimental correlation with the results of SPICE simulations and/or calculations based upon simplified models
5. Correctly use the basic analog laboratory instruments

Outcome b
Supported by SLOs 1, 2, 4, and 5
Outcome g
Supported by SLO 3
Outcome k
Supported by SLOs 4 and 5

Dr. King (chair)
Dr. Jha
Dr. Johnson

April 23, 2010
EECS 3460 ENERGY CONVERSION

STUDENT LEARNING OBJECTIVES

The student will be able to…

1. Understand the basic properties of magnetic materials and how to analyze magnetic circuits.
2. Perform analysis of transformer models and applications.
3. Understand fundamental concepts of rotating machines and use of energy and co-energy functions.
4. Understand synchronous motors and generator analysis and applications.
5. Understand basics of dc motors and generators and applications.
6. Understand induction motor analysis and applications, both 3-phase and 1-phase.

EAC OUTCOMES SUPPORTED

Outcome a
Supported by SLOs 1 through 6
Outcome e
Supported by SLOs 1 through 6
Outcome h
Supported by SLOs 2 and 4
Outcome k
Supported by SLOs 1 through 6

COMMITTEE MEMBERS

Dr. Stuart (chair)
Dr. King
Dr. Molyet

APPROVAL DATE

April 09, 2010
EECS 3480 ENERGY CONVERSION LAB

STUDENT LEARNING OBJECTIVES

The student will be able to...
1. Perform transformer connections and measure parameters.
2. Measure machine parameters and understand operation.
3. Understand synchronous machine operating principles and characteristics.
4. Understand operating principles of different types of dc motors and applications.
5. Understand operating principles of different types of dc generators and applications.
6. Understand operating principles of different types of induction motors and applications.

EAC OUTCOMES SUPPORTED

Outcome a
Supported by SLOs 1 through 6
Outcome b
Supported by SLOs 1 through 6
Outcome e
Supported by SLOs 1 and 6
Outcome g
Supported by SLOs 1 through 6
Outcome k
Supported by SLOs 1 through 6

COMMITTEE MEMBERS

Dr. Stuart (chair)
Dr. King

APPROVAL DATE

April 09, 2010
The student will be able to…

1. Learn/review the basics of harmonic waves and the phasor technique.
2. Learn the basics of transmission lines (TL), Propagation of harmonic signals on TL, TL parameters and equations. Be able to apply the knowledge in basic analysis and design problems.
3. Learn the basics of the Smith Chart as a tool for transmission line calculations. Be able to use the chart for basic parameter calculation and analysis of transmission lines.
4. Learn/review vector algebra, vector analysis, and orthogonal coordinate systems basics. Be able to apply vectors in solving relevant problems.
5. Learn/review important electrostatic concepts, such as Coulomb’s law, Gauss’ law, Maxwell’s equations, electric field boundary conditions, and electrostatic potential. Be able to apply these concepts in basic electric field and potential calculations.
6. Learn/review the basics of materials and their electrical properties, as well as related concepts of resistance, capacitance, and electrostatic energy. Be able to apply this knowledge in basic analysis and design problems.
7. Learn/review important magnetostatics concepts, such as magnetic forces and torques, Biot-Savart’s and Ampere’s laws, magnetic field boundary conditions and vector magnetic potential. Be able to apply these concepts in basic magnetic field and potential calculations.
8. Learn/review the basics of materials and their magnetic properties, as well as related concepts of inductance and magnetic energy. Be able to apply this knowledge in basic analysis and design problems.
9. Learn/review Maxwell’s equations for time-varying fields, and the related results and concepts such as Faraday’s law, electromagnetic induction, charge-current continuity relation, displacement current, and electromagnetic potentials. Be able to apply these concepts in basic calculations.
10. Learn/review the basics of the materials electromagnetic properties, as well as the principles of transformers, electromagnetic generation and actuation and free-charge dissipation in conductors.
11. Learn the basics of the electromagnetic wave propagation in free space as described by the Maxwell equations and the resulting wave equation.

EAC OUTCOMES SUPPORTED

- Outcome a Supported by SLOs 1 through 11
- Outcome k Supported by SLOs 3, 5, and 7

COMMITTEE MEMBERS

Dr. Georgiev (chair)
Dr. Devabhaktuni
The student will be able to…

1. Design a complex system (or component or process) to realistic performance specifications in compliance with applicable engineering standards.
2. Build a prototype of a design and demonstrate that it meets performance specifications.
3. List and discuss several possible reasons for deviations between predicted and measured results from an experiment or design, and choose the most likely reason and justify the choice.
4. Identify the stages of team development and give examples of team behaviors that are characteristic of each stage.
5. Summarize effective strategies for dealing with a variety of interpersonal and communication problems that commonly arise in teamwork, choose the best of several given strategies for a specified problem, and justify the choice.
6. Function effectively on a team, with effectiveness being determined by instructor observation, peer ratings, and self-assessment.
7. Explain aspects of a project, process, or product related to specified engineering and non-engineering disciplines.
8. Given a job-related scenario that requires a decision with ethical implications, the student will be able to identify possible courses of action and discuss the pros and cons of each one, pick the best course of action and justify the decision.
9. Write an effective technical correspondence (i.e. abstract, executive summary, project report) or give an effective oral presentation.
10. Propose a solution or critique a proposed solution to an engineering problem, identifying possible negative global or societal consequences and recommending ways to minimize or avoid them.
11. Find relevant sources of information about a specified topic in the library and on the World Wide Web (or perform a full literature search).
12. Participate effectively in a team project and assess the strengths and weaknesses of the individual team members (including himself/herself) and the team as a unit.
13. Identify important contemporary regional, national, or global problems that involve engineering.
14. Propose and discuss ways engineers are contributing or might contribute to the solution of specified regional, national, and global problems.

EAC OUTCOMES SUPPORTED

Outcome c  Supported by SLOs 1 through 3
Outcome d  Supported by SLOs 4, 5, 6, and 12
Outcome f  Supported by SLO 8
Outcome g  Supported by SLO 9
Outcome h  Supported by SLOs 7, 10, and 14
Outcome i
Supported by SLO 11
Outcome j
Supported by SLO 13
Outcome k
Supported by SLOs 1 through 3

COMMITTEE MEMBERS

Dr. Serpen (chair)
All EECS Faculty

APPROVAL DATE

June 3, 2010
STUDENT LEARNING OBJECTIVES

The student will be able to…

1. Design arithmetic circuits such as adders, multipliers and dividers
2. Design a system from problem specifications with minimum hardware and minimum computation time.
3. Apply digital system design principles and descriptive techniques
4. Analyze and design functional building blocks and control and timing concepts of digital systems.
5. Understand timing simulation to measure delays and study signals subject to timing constraints
6. Identify a problem, formulate, design and solve the problem
7. Present results to the class using power point and able to defend their work.
8. Utilize programmable devices such as FPGAs to implement digital system design
9. Model and simulate a digital system using hardware description language like VHDL.
10. Distinguish among various forms of verifications

EAC OUTCOMES SUPPORTED

Outcome a
Supported by SLO 1

Outcome c
Supported by SLOs 2, 3, and 4

Outcome e
Supported by SLOs 5 and 6

Outcome g
Supported by SLO 7

Outcome k
Supported by SLOs 8, 9, and 10

COMMITTEE MEMBERS

Dr. Jamali (chair)
Dr. Miller

APPROVAL DATE

April 28, 2010
EECS 4200 FEEDBACK CONTROL SYSTEMS

STUDENT LEARNING OBJECTIVES

The student will be able to…
1. ......

EAC OUTCOMES SUPPORTED

Outcome
Supported by SLOs

COMMITTEE MEMBERS

Dr. Molyet (chair)
Dr. King

APPROVAL DATE

Version: 10 June 2010
STUDENT LEARNING OBJECTIVES

The student will be able to…

1. Determine the spectral contents of time-domain signal by applying Fourier analysis.
2. Describe and analyze the mathematical techniques of generation, transmission and reception of analog modulation signals.
3. Convert analog signals to digital format using sampling and quantization techniques.
4. Describe and analyze the methods of transmission of digital data using baseband and carrier modulation techniques.
5. Evaluate the performance of digital data transmission in the presence of additive white Gaussian noise.
6. Use software to implement the communication system and analyze its performance.

EAC OUTCOMES SUPPORTED

Outcome a
Supported by SLOs 1 through 5
Outcome k
Supported by SLO 6

COMMITTEE MEMBERS

Dr. Kim (chair)
Dr. Jamali

APPROVAL DATE

April 22, 2010