COMPUTER ENGINEERING PROGRAM

COURSE SYLLABI

EE 201 – COMPUTER PROGRAMMING I (3,3,1) 3 Credits
(Core course offered in fall and spring)

Bulletin Description: Introduction to computers. Simple algorithms and flowcharts. Solving engineering and mathematical problems using a mathematically-oriented programming language. Programming concepts: I/O, assignment, conditional loops, functions and subroutines. Programming selected numerical and non-numerical problems of mathematical and engineering nature

Prerequisites: Math 101, ELCE102

Textbooks: William J. Palm III, Introduction to MatLab 7 for Engineers, McGraw-Hill International Edition, 2005

References:

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. describe the basics of Matlab
2. apply Matlab to solve engineering problems
3. describe the fundamentals of programming
4. design simple programs
5. modularize the programs using functions

Course Topics:

1. Engineering Problems and the Need for Computer Solutions
2. Basics of MatLab: Menus – Toolbars – Computing with MatLab – Script Files and the Editor/Debugger – MatLab help System.
3. Arrays, Matrices and Matrix Operations.
4. User-Defined Functions.
5. Working with Data Files.
6. Basics of Programming: Algorithms - Pseudo Code - Flow Charts – Programming Structures.
7. Program Design and Development.
8. Relational Operations and Logical Variables.
9. Logical Operators and Functions.
10. Conditional Statements: if – else – elseif - switch
11. Loops: for – while – break – continue.
12. Debugging MatLab Programs.
13. Graphing Functions: XY Plots – Sub-Plots
14. Introducing Simulink.

Class Schedule:

Lecture: There are three hours of lectures per week. You have to attend all lectures.

Tutorials: There are two hours of lab per week, compulsory to attend. You will sign in. Those who miss lab periods, miss points, and also suffer in the Final Exam

Course Contribution to Professional Component:

Engineering Science: 75 %
Engineering Design: 25 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria		
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**
Average attainable level of learning (*)	M	L	H		H						M		H	H

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Drs Alaa Gowdah and Haitham Al-Angari

Last Updated: **October, 2007**

EE 202 – OBJECT-ORIENTED COMPUTER PROGRAMMING (3,3,1) 3 Credits
(Core course offered in fall and spring terms)

Bulletin Description: Object-oriented programming: classes, objects and methods. Object-oriented design. Simple data structures. Best programming practices (structured coding, documentation, testing and debugging)

Prerequisites: EE 201

Textbooks: Gary J. Bronson, A First Book of C++, 2nd ed Brooks/Cole Publishing Co, 2000.

References: Camal Gambi, Problem Solving Using C++, 3rd ed. (Arabic), Dar Al Hafiz Publishing, 1997.

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. identify different computer components including new technologies
2. recognize how computer programs work
3. analyze engineering problems
4. breakdown a problem situation into components (input, output, procedure)
5. describe the syntax and semantics of a C++ program
6. choose appropriate input and output methods and formats
7. choose appropriate control structures to account for different cases of input and different levels of accuracy
8. choose the best data type for a solution among simple and derived data types such as arrays, character strings, structures, and classes
9. modularize the programs using functions and classes in C++
10. design algorithms to solve scientific and engineering problems using computers
11. design and implement object-oriented programs

Course Topics:

1. Review basic computer information covered by level I
2. C++ program structur and data types and their operations
3. Input and Output functions
4. Assignment and Interactive input
5. Selection using if-else, nested if, and switch
6. Repetition using while, for, and do statements
7. Arrays including one dimensional and 2-dimensional arrays
8. Pointers and character strings
9. Functions, and their arguments
10. Structures and their applications
11. C++ classes and objects
12. Inheritance
13. Recursion
14. Simple algorithms (searching and sorting)
15. Testing and debugging
16. Documenting

Class Schedule:

Lecture: Two 75-minute lectures for 14 weeks
Tutorials: One two hours lab/tutorial every week

Course Contribution to Professional Component:

Engineering Science: 75 %
Engineering Design: 25 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria					
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**			
Average attainable level of learning (*)	M	M	H		H				L		M		H	M			

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Ali H. Morfeq

Last Updated: October, 2007

EE 250 – BASIC ELECTRICAL CIRCUITS (4,3,2) 4 Credits
(Core course offered in fall and spring terms)

Bulletin Description: Electric quantities and circuit elements. Kirchhoff's laws. Mesh and node analyses. Sinusoidal steady-state analysis using phasors. Network theorem and transformations. Ideal transformers. Three-phase circuits.

Prerequisites: **PHYS 102, ELC 102**

Textbooks: Alexander "Fundamentals of electric circuits", Second edition

References: Course website : http://engg.kau.edu.sa/~aabdulwhab/ee250/

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. understand fundamental electric quantities: voltage, current, electric power and energy.
2. identify the difference between dependant and independent voltage and current sources.
3. analyze and evaluate responses of circuits containing resistance, capacitance and inductance elements according to fundamental circuit laws.
4. calculate the currents and voltages in resistive circuits using Ohm's law, KCL, KVL, reduction of series and parallel resistances, and voltage and current divisions
5. find the node voltages in resistive circuits containing current sources and voltage sources using nodal analysis
6. find the mesh currents and branch currents in resistive circuits containing voltage sources and current sources using mesh analysis
7. analyze resistive circuits containing multiple sources by using superposition
8. apply Thevenin's and Norton's theorems to simplify a resistive circuit by finding the Thevenin or Norton equivalent of a two-terminal network
9. apply KVL, KCL, nodal and mesh analysis to circuits containing dependent sources.
10. apply the source transformation and Y-Δ transformation to simplify circuits.
11. evaluate maximum power transfer to a variable load resistance.
12. understand time varying voltage and current and appreciate sinusoidal signals in AC circuits.
13. evaluate effective or rms values of AC voltages and currents.
14. find the phasor voltage (current) for a given sinusoidal voltage (current), and find the sinusoidal voltage (current) for given phasor voltage (current) and frequency.
15. find the impedances of resistors, capacitors, and inductors for a given frequency
16. convert an AC steady-state circuit to a phasor circuit
17. analyze a phasor circuit using Ohm's law, KCL, KVL, reduction of series and parallel impedances, and voltage and current divisions
18. calculate AC steady-state power dissipated by the circuit elements in a circuit
19. understand the concepts of power factor, complex power, and conservation of power.
20. solve single and three phase circuits using VA method for the real, reactive and complex power supplied by, or consumed by any device in the circuit; and use reactive compensation for power factor improvement.
21. solve simple three-phase circuits to calculate any system voltage, current or power.
22. understand and be able to use per phase analysis to solve simple three-phase systems.
23. derive the voltage and current relationships for an ideal transformer.
24. work with a small team to carry out experiments in electric circuits and prepare reports that present lab work.

Course Topics:

EE 250	Topics	Time (week)
TOP_1	Fundamental electric quantities: voltage, current	0.25
TOP_2	Electric power and energy	0.25
TOP_3	Independent and dependant sources	0.5
TOP_4	Resistance, capacitance and inductance	0.67

EE 250	Topics	Time (week)
TOP_5	Kirchhoff's laws (KVL & KCL)	0.67
TOP_6	Source equivalence and conversion	0.67
TOP_7	Mesh current (loop) analysis	1
TOP_8	Node voltage analysis	1
TOP_9	Super-position theorem	0.5
TOP_10	Δ/Y transformation	0.5
TOP_11	Thevenin's and Norton's theorems	1
TOP_12	Sinusoidal excitation, average and effective values	1
TOP_13	Complex numbers	1
TOP_14	Steady state a.c. circuit and impedance	1
TOP_15	Phasor diagrams	1
TOP_16	Maximum power transfer theorem	1
TOP_17	Power triangle and power factor correction	1
TOP_18	Balanced three phase circuits	1
TOP_19	Power measurement in three phase circuits	1
TOP_20	Ideal transformer	1

Class Schedule:

Lecture: There will be about three 50 minutes lectures per week. During the lectures:,There might be a 5-minute pop quiz. Students may be asked to participate and answer questions

Tutorials: Students are highly encouraged to attend the tutorial sessions to practice solving practical problems. Lab attendance and participation is mandatory

Course Contribution to Professional Component:

Engineering Science: 85 %
Engineering Design: 15 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria					
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**			
Average attainable level of learning (*)	M	L	L	M	M		M		L	L	M		M	M			

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Abdulaziz Uthman Al-Abdulaziz

Last Updated: October 2007

EE 253 – ELECTRICAL AND ELECTRONIC MEASUREMENTS (4,3,3) 4 Credits
(Core course offered in fall and spring terms)

Bulletin Description: The course provides students with a back ground in electrical and electronic measurements and instrumentation. Terms related to electrical measurements are investigated. The function elements of a general measuring instrument, sources of error , and methods of error analysis are introduced. Principles, limitations, and applications of oscilloscopes, analog DC and AC ammeters and voltmeters will be studied. Ohmmeters, DC and AC bridges are analyzed. Power and reactive power measurements are covered. Electronic and digital measurement systems will also be given some consideration.

Prerequisites: EE301, IE331 (Concurrent)

Textbooks: A.K. Sawhney, " A Course in Electrical and Electronic Measurements and Instrumentation", DHANPAT RAI, Seventeenth Edition, 2004

References: Martin U, Reissland, Electrical Measurements: Fundamentals, Concepts, and Applications, New Age International Publishers, New Delhi, 2003

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. describe the instrument functions and define terms related to electrical measurements
2. demonstrate the different stages of the generalized measurement system
3. illustrate the error sources in measurements
4. apply statistical analysis of errors
5. calculate the probable and limiting errors
6. apply mathematical analysis of the uncertainty
7. demonstrate a practical representation of a general purpose cathode ray tube (CRT)
8. illustrate a block diagram of a basic oscilloscope and label each block
9. demonstrate the functions of the following: vertical amplifier, horizontal amplifier, sweep generators, and trigger circuit
10. distinguish the basic principle of operation of the dual trace oscilloscope
11. apply the oscilloscope to measure: the frequency and amplitude of a signal, the phase-shift between signals
12. identify the operation controls of a triggered oscilloscope and adjust the control
13. operate DC and AC voltage and frequency measurements with the oscilloscope
14. operate frequency and phase difference measurements using Lissajous patterns
15. classify the analog instruments
16. illustrate the functions and methods of producing the following forces: deflecting, controlling, and damping force
17. demonstrate principle of operation, construction, torque equations, temperature effect correction, loading effects, errors, and applications of the following instruments: permanent magnet moving coil, series type and shunt type ohmmeters
18. propose an Ayrton shunt across a meter movement to obtain specific meter readings of current
19. propose multipliers or shunts to obtain specific meter ranges of voltage and current
20. demonstrate construction, principle of operation, limitations, waveform error, and applications of a half- wave and full-wave rectifier type meters
21. investigate the principle of operation, frequency range ,torque equation ,errors, and applications of : moving iron meter, electrodynamometer , and single phase electrodynamometer wattmeter
22. employ instrument transformers in power measurements
23. carry out measurements of power in three phase circuits using: three- wattmeter's method, two- wattmeter's method, one wattmeter method, three-phase wattmeter
24. operate measurements of reactive power in single phase and three-phase circuits
25. analyze and indicate the applications of: Maxwell’s inductance bridge, Maxwell’s inductance capacitance bridge, Hay’s bridge, Modified De Sauty’s bridge, Heaviside mutual inductance bridge, Wien’s bridge, Universal bridge

26. summarize sources of error in bridge circuits
27. Illustrate the advantages of an electronic measuring instruments
28. demonstrate principle of operation and applications of: the voltage attenuator, the current to voltage converter, the ac to dc converter, the resistance to voltage converter, peak and average detectors, and true rms value detector
29. illustrate the advantages of digital instruments
30. demonstrate principle operations and constructions of : A/D converter (ramp type), the decade counter, digital display units (7-segmental display), the decoder
31. illustrate organization, principle of operation, and applications of digital voltmeter
32. prepare and design experimental measurements of: dc voltage and current, ac voltage and current indicating waveform errors, resistance and power measurements
33. demonstrate effective teamwork both in planning and in carrying out experimental activities
34. prepare an engineering report that presents and analyzes laboratory work

Course Topics

EE 253	Topics	Time (Hrs)
TOP_1	Fundamental Measurement Concepts: terms related to electrical measurements, generalized measurement system, sources of errors, statistical analysis of errors, and uncertainty analysis.	6
TOP_2	Cathode Ray Oscilloscope: construction, principle of operation, and applications.	6
TOP_3	Analog instruments: principle of operation, types, and operating forces.	3
TOP_4	DC instruments: construction, principle of operation, torque equation, extension of range, Loading effects, temperature effect correction, limitation, errors, and applications of :(a) Permanent magnet moving coil. (b) Series and shunt type ohmmeters.	7
TOP_5	AC instruments: construction, torque equation, extension of range, limitations, and applications of: (a) rectifier type. (b) moving iron. And (c) electrodynamometer type.	7
TOP_6	Measurement of power and reactive power in single-phase and three-phase circuits.	4
TOP_7	DC and AC Bridges.	3
TOP_8	Electronic instruments: attenuators, electronic converters and detectors.	3
TOP_9	Digital instruments: digital versus analog instruments, analog-to- digital ramp type conversion, decade counter, digital display units, and digital voltmeter	5
TOP_10	Lab activities	9
TOP_11	Project	0

Class Schedule: Lecture: Two one and a half hours sessions per week
Tutorials/Lab: one two hours lab and one-hour tutorial sessions per week

Course Contribution to Professional Component:

Engineering Science: 100 %
Engineering Design: %

Course Relationship to Program Outcomes:

	Engineering Criteria											**Program Criteria**					
P Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**			
Av. attainable level of learning (*)	M	M		M	M	M	M	M			M	M	M				

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Ahmed Milyani

Last Updated: October 2007

EE 300 – ANALYTICAL METHODS IN ENGINEERING (3,3,1) 3 Credits
(Core course offered in fall and spring terms)

Bulletin Description: Linear algebra: matrices and determinants, eigenvalues and eigenvectors. Complex analysis: integration in the complex plane and residue analysis. Graphs, fundamental loops, fundamental cutsets.

Prerequisites: MATH 203

Textbooks: E. Kreyzig, Advanced Engineering Mathematics, 9th Ed, Wiley, 2006

References:

1. D. Zill and P. Shanahan, Complex Analysis, Jones and Bartlett, 2003.
2. F. Ayres, Matrices, McGraw-Hill, 1974.
3. W. Chen, Applied Graph Theory, North-Holland, 1976

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. understand the concept of scalars, vectors, and matrices
2. understand and construct simple mathematical proofs that are of engineering utility
3. recognize and handle some important classes of matrices: symmetric, ske-symmetric, involutory, idempotent, nilpotent, orthogonal, and orthonormal
4. recognize the linear dependency and independency of vectors
5. determine the existence of a square matrix inverse
6. calculate the matrix inverse using Gauss-Elimination method, the Gauss-Jordan method and the Cofactor method
7. solve linear equations using Gauss-Elimination method and Cramer's rule
8. understand the concept of graphs and directed graphs
9. apply the graph theory to obtain and relate the reduced incidence matrix, the fundamental cutest matrix, and the fundamental loop matrix, based on a specific choice of datum (reference) node and spanning tree.
10. write KCL and KVL for a given directed graph and express tree currents in terms of link currents and link voltages in terms of tree voltages
11. manipulate complex numbers in different basic mathematical operations
12. compute function values of complex variables
13. differentiate and integrate complex variable functions
14. understand the geometry of analytic functions and conformal mapping
15. manipulate various types of series: power, Taylor, and Laurent
16. apply Cauchy integration formula and residual theorem
17. use contour integration to evaluate real improper integrals
18. compute matrix eigenvalues and their associated eigenvectors and eigenspaces
19. apply the fundamental concepts of matrix eigenvalues in practical problems

Course Topics:

1. Complex numbers and operations
2. Special complex functions
3. Complex derivatives and conformal mapping
4. Various types of series: power, Taylor, and Laurent
5. Integration in the complex plane
6. Residue integration and it's applications
7. Introduction to linear algebra and vector spaces
8. Basic concepts, properties, and algorithms of matrices, their inverses and determinants
9. Eigenvalues and eigenvectors and their applications
10. Introduction to graph theory

Class Schedule:

Lecture: three one-hour or two one-and-a half-hour lectures per week

Tutorials: one 2-hour tutorial per week

Course Contribution to Professional Component:

Engineering Science: 90%

Engineering Design: 10%

Course Relationship to Program Outcomes:

	Engineering Criteria											**Program Criteria**					
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**			
Average attainable level of learning (*)	M				M								M	M			

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: **Prof. Dr. Ali Muhammad Rushdi**

Last Updated: October, 2007

EE 301 – ELECTRICAL CIRCUITS AND SYSTEMS (3,3,1) 3 Credits
(Core course offered in fall and spring terms)

Bulletin Description: Resonance circuits. Magnetically-coupled circuits. Op-amp circuits. Transient analysis via the conventional and Laplace methods. Fourier analysis with applications to circuits. Two-port networks.

Prerequisites: MATH 204 , EE 250

Textbooks: C. K. Alexander & M. N. Sadiqu, Fundamentals of Electric Circuits, 2nd ed., McGraw-Hill, 2004

References:

1) J. W Nilsson & S. Radio, Electric Circuits, 6th ed., Addison Wesley, 2001.
2) R. Strum & J. Ward, Electric Circuits and Networks, 2nd ed., Prentice Hall, 1985.
3) C. Paul, Analysis of Linear Circuits, McGraw-Hill, 1989.
4) W. Hayt & J. Kemmerly, Engineering Circuit Analysis, McGraw-Hi1I, 1993.
5) L. P. Huelsman, Basic Circuit Theory, Prentice-Hall, 1984.

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. identify the two types of resonance circuits
2. analyze resonance circuits to get the resonant frequency, corner frequencies, power, bandwidth, and quality factor
3. analyze electric circuits with magnetically-coupled elements
4. analyze the ideal op-amp circuits: inverting, non-inverting, adders, subtractors, integrators, and differentiators
5. analyze op-amp circuits to calculate the transfer function
6. differentiate whether or not a circuit has initial conditions, and find them if not given
7. transfer circuit elements into Laplace domain and solve circuits using Laplace transform method
8. calculate the Fourier Series coefficients of periodic signals
9. analyze electrical circuits of multiple periodic sources utilizing Fourier Series techniques
10. mathematically derive the Fourier Transform of non-periodic signals
11. analyze electrical circuits of non-periodic sources utilizing Fourier Transform techniques
12. derive the impulse response and the transfer function of linear systems using Fourier and Laplace Transforms
13. derive the convolution integral form of two signals
14. use the convolution integral to find the response of electrical circuits
15. use the graphical method of the convolution integral to find the electrical circuit response
16. differentiate between one-port and two-port networks
17. calculate the different parameters of two-port networks: Z-parameters, Y-parameters, H-parameters, G-parameters, transmission-parameters, and the inverse-transmission-parameters
18. analyze the terminated and non-terminated two-port networks

19. analyze two-port networks in different interconnections

Course Topics:

1. Operational Amplifiers (Chapter 5)
2. Magnetically Coupled Circuits (Chapter 13)
3. Frequency Response (Chapter 14)
4. The Laplace Transform (Chapter 15)
5. Applications of Laplace Transforms (Chapter 16)
6. Fourier Series (Chapter 17)
7. Fourier Transform (Chapter 18)
8. Two-Port Networks (Chapter 19)

Class Schedule:

Lecture: Sun & Tue. : 9:30 – 11:00
Tutorials: Tue. : 2:30 – 4:20

Course Contribution to Professional Component:

Engineering Science: 100 %
Engineering Design: 0 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria					
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**			
Average attainable level of learning (*)	M				M								M	M			

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Muhammad Ashenkeeti

Last Updated: October, 2007

EE 305 – Discrete Mathematics and Its Applications (3,3,1) 3 Credits
(Core course offered in spring term)

Bulletin Description: Functions, relations and sets. Basic logic. Proof techniques. Basic counting. Graphs and trees. Modeling. Computation. Types of functions and relations. Cartesian products and power sets. Propositional logic, Logical equivalence quantifiers. Mathematical induction, recursive definitions. Pigeonhole principle, permutations, combinations, recurrence relations. Binary trees, traversals. Graph Isomorphism, connectivity, Euler and Hamilton paths. Planar graphs. Graph coloring. Formal languages, grammars, and finite state machines. Turing machines and computability.

Prerequisites: Junior Standing EE 202, IE 202, MATH 204

Textbooks: Discrete Mathematics and Its Applications. Kenneth H. Rosen. McGraw-Hill, 6th edition, 2007

References:

Course Learning Objectives (CLO)

1. After finishing the course successfully, the student shall
2. Prove simple logical arguments.
3. Develop recursive algorithms based on mathematical induction.
4. Count using combinations and permutations.
5. Solve recurrence relations.
6. Know basic properties of relations.
7. Know essential concepts in graph theory and related algorithms.
8. Understand basic concepts in formal languages and computability.
9. Build Turing machines.
10. Apply knowledge about discrete mathematics in problem solving.

Course Topics:

1. The Foundations: Logic, Sets, and Functions Logic (2 weeks)
2. (Propositional Equivalences, Predicates and Quantifiers, Functions, Sets, Set Operations, The Growth of Functions, Sequences and Summations
3. Mathematical Reasoning, Induction, and Recursion (3 weeks)
4. Methods of Proof, Mathematical Induction, Recursive Definitions, Recursive Algorithms
5. Counting (3 weeks)
6. The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Recurrence Relations, Solving Recurrence Relations
7. Relations (1 and 1/2 week)
8. Representing Relations, Relations and Their Properties, n-ary Relations and Their Applications, Closures of Relations, Equivalence Relations
9. Graphs (2 and 1/2 weeks)
10. Introduction to Graphs
11. Graph Terminology, Representing Graphs and Graph, Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest Path Problems, Planar Graphs, Graph Coloring
12. Trees (1 week)
13. Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees
14. Modeling Computation (1 week)
15. Languages and Grammars, Language Recognition, Turing Machines

Class Schedule:

Lecture: There are three hours of lectures per week.

Tutorials:

Course Contribution to Professional Component:

Engineering Science: 90 %
Engineering Design: 10 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria					
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**
Average attainable level of learning (*)	H	M	M		M						M	L	M	H			

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Mohammad H. Awedh

Last Updated: Sept. 2007

EE 311 – ELECTRONICS I (4,3,3) 4 Credits
(Core course offered in fall and spring terms)

Bulletin Description: Characteristics of diodes, bipolar junction transistors and field effect transistors. States/modes of operation of these devices. Large-signal and small signal circuit models. Application of these devices in basic electronic circuits: rectifiers, limiting circuits, regulated power supplies, logic circuits, electronic switches, amplifiers.

Prerequisites: EE 250

Textbooks: Adel S. Sedra and Kenneth C. Smith, Microelectronic Circuits (5^{th} Ed), Oxford University Press, 2003

References: Rashid, Mohammed H., Microelectronic Circuits, PWS Publishing Company, 1998
Jacob Millman and Arvin Gabel, Microelectronic (2nd Ed), McGraw-Hill, 1987

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. reproduce the current-voltage characteristics of an ideal diode and a pn junction diode in a graph and as a functional relationship
2. identify and distinguish between different modes and regions of operation of a diode
3. Analyze diode circuits using graphical and iterative methods
4. prepare piecewise linear models of diodes and apply them to the analysis of diode circuits
5. sketch the load line and compute the operating point (bias point, quiescent point, Q-point) in a diode circuit
6. separate the complete analysis into DC analysis and AC analysis and produce the small signal model of diodes
7. analyze basic diode circuits (rectifiers, clippers, zener shunt regulators)
8. design a rectifier circuit and shunt regulated DC power supply
9. recall and sketch the Ebers-Moll model of a BJT
10. define and distinguish between different modes of operation of BJT
11. Analyze a BJT circuit having DC sources only
12. design a BJT biasing circuit
13. Analyze BJT amplifiers of various configurations
14. design a BJT amplifier with given gain, input and output resistance
15. define and distinguish between different modes of operation of FET
16. recall the current-voltage relation of FET
17. Analyze a FET circuit with DC sources only
18. design a FET biasing circuit
19. Analyze FET amplifiers of various configurations
20. design a FET amplifier with given gain, input and output resistance
21. conduct experiment to measure device (diode, BJT, FET) characteristics and report results
22. conduct experiments to measure characteristics of electronic circuits (rectifiers, clipping circuits, amplifiers) and report results
23. use ORCAD PSPICE in solving problems and designs
24. setup experiments to verify the performance of designed circuits
25. Collect info and report about an electronic device

Course Topics:

Ideal diodes and its i-v characteristic. (2 weeks)

1. Terminal characteristic of junction diodes.
2. Techniques of the diode circuit analysis.
3. The small signal model of the diodes. (1 week)
4. Operation in the breakdown region the-zener diodes.
5. Application of diodes in typical circuits: rectifiers, regulated power supplies, logic gates, limiting circuits etc. (2 weeks)

Bipolar Junction Transistors (BJT's)

6. Physical structure, NPN and PNP transistors. (1 week)
7. Elebrs-Moll model and graphical representation of BJT characteristics.
8. Analysis of BJT circuits at DC: modes of operation, transistor as a switch, biasing the BJT. (2 weeks)
9. Transistor as an amplifier, graphical analysis, small signal equivalent circuit models. (2 weeks)
10. Analysis of basic BJT amplifier configurations.

Field Effect Transistors (FETs)

11. Current- Voltage characteristics of different types of FETs, regions of operation. (1 week)
12. Analysis of FET circuits at DC, biasing the FET. (2 weeks)
13. FET as an amplifier, graphical analysis, small signal equivalent circuit models. (2 weeks)
14. Analysis of basic FET amplifier configurations.

Class Schedule:

Lecture: two one and half hours sessions per week

Tutorials/Lab: one two-hours lab and one-hour tutorial sessions per week

Course Contribution to Professional Component:

Engineering Science: 65 %

Engineering Design: 35 %

Course Relationship to Program Outcomes:

	Engineering Criteria											**Program Criteria**					
P Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**			
Av. attainable level of learning (*)	M	M	M		M	L	M		M		M		M				

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Solimanul Mahdi

Last Updated: October 2007

EE 312 – ELECTRONICS II (4,3,3) 4 Credits
(Core course offered in fall and spring terms)

Bulletin Description: Feedback in amplifiers. Frequency response of amplifiers. Operational amplifiers: design and applications as linear and non-linear analog building blocks, adders, subtractors, differentiators, integrators, analog simulation, active filters. Logarithmic and exponential amplifiers, precision converters, analog multipliers, wave-shapers, sinusoidal and square wave oscillators.

Prerequisites: EE 311

Textbooks: Adel S. Sedra and Kenneth C. Smith, Microelectronic Circuits (5th Ed), Oxford University Press, 2003

References: Rashid, Mohammed H., Microelectronic Circuits, PWS Publishing Company, 1998

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. identify the components that influence the bandwidth of single and multistage common-emitter and common-collector BJT amplifiers
2. calculate the bandwidth of a given single and multistage BJT amplifier
3. design a single and multistage CE-CC BJT amplifier with specified bandwidth
4. identify the topology of amplifiers with feedback
5. convert feedback amplifiers into equivalent amplifiers without feedback
6. calculate the gain, input and output resistances of BJT feedback amplifiers
7. describe the external characteristics of op-amps
8. analyze the operation of linear analog circuits using ideal op-amps
9. design linear analog building blocks using op-amps, e.g., general adder/subtractors, differentiators, integrators, precision rectifiers, instrumentation blocks, analog computers, digital-to-analog and analog-to-digital converters
10. classify the type of a given filter
11. determine the type and the order of the filter needed to meet the specifications
12. calculate the poles of the required transfer function
13. design analog active filters with given specifications
14. estimate the implementation cost of BJT amplifiers, op-amp application and active filters
15. simulate and verify amplifiers and filters using CAD tools
16. prepare a PCB for a given analog design using CAD tools
17. work in a team effectively

Course Topics:

1. Review of basic BJT Amplifiers
2. Frequency response
3. Feedback Amplifiers
4. Operational Amplifiers
5. Filters and Tuned Amplifiers
6. Signal Generators
7. Project

Class Schedule:

Lecture: two one and half hours' sessions per week
Tutorials/Lab: one two hours lab and one-hour tutorial sessions per week

Course Contribution to Professional Component:

Engineering Science: 65 %
Engineering Design: 35 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria					
P Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**			
Av. attainable level of learning (*)	M	M	H	M	H						M						

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Ashraf Uddin

Last Updated: October 2007

EE 321 – INTRODUCTION TO COMMUNICATIONS (4,3,3) 4 Credits
(Core course offered in fall and spring terms)

Bulletin Description: Fourier Signal Analysis. Linear Modulation: AM, DSBSC, SSB, Frequency Conversion, generation and detection, FDM, Exponential Modulation: FM, PM, NBFM, WBFM. Pulse Modulation, Sampling Theorem, PAM, PDM, PPM, TDM, PCM.

Prerequisites: EE 301

Textbooks: B. P. Lathi, “Modern Digital and Analog Communication Systems”, Oxford University Press, 3rd edition, 1998.

References:

1. S. Haykin, “Communication Systems”, 4th edition, Wiley.

2. A. Bruse Carlson, Paul B. Crilly, Janet C. Rutledge, “Communication Systems: An Introduction to Signals and Noise in Electrical Communications”, 4th edition, McGraw-Hill, 2002

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. classify a signal as an energy or power signal
2. classify a system as linear or non-linear, time-varying or time-invariant, causal or non-causal
3. define impulse response and transfer function of a system
4. evaluate impulse response and transfer function of a LTI system
5. compute the output of a system for a given input
6. classify a filter as low-pass, band-pass, band-reject, or high-pass
7. apply Fourier series and transform to analyze LTI systems with periodic and non-periodic inputs
8. apply convolution to evaluate the output of a LTI system
9. define and find the bandwidth of a LTI system
10. define modulation
11. explain the need for, and list basic applications of, modulation
12. define and write mathematical expressions for different types of AM modulation
13. analyze AM modulated signals in time and frequency domains
14. compute the power and bandwidth of an AM modulated signal
15. analyze of operation of AM modulators and demodulators
16. define and write mathematical expressions for angle modulation
17. analyze angle-modulated signals in time and frequency domains
18. compute the power and bandwidth of an angle-modulated signal
19. analyze of operation of angle modulators and demodulators
20. analyze or design a frequency division multiplexer
21. analyze or design a superheterodyne receiver
22. explain the sampling theorem and its applications in A/D conversion and time division multiplexing
23. explain the principles of PAM, PWM, PPM, PCM
24. analyze a PAM/TDM system

Course Topics:

1. Classifications of signals and systems. Energy and power signals, Linear time invariant systems (LTI), Fourier series representation, Fourier transform, Spectral properties and bandwidth, unit step and unit impulse functions, Impulse response and transfer function of linear systems, Filters (LPF, HPF, and BPF)
2. Amplitude modulation (Double side-band - Large carrier (DSB-LC)), Double side-band - Suppressed Carrier (DSB-SC), Single side-band (SSB); Hilbert Transform , Vestigial side-band (VSB); Spectral analysis, modulators, demodulators, Super heterodyne receiver.
3. Frequency modulation, Phase modulation; spectral analysis, bandwidth, generation, detection, discriminators, phase-locked-loop (PLL), Frequency division multiplexing (FDM)
4. Sampling theorem, Pulse amplitude modulation (PAM), Time-division multiplexing (TDM), Pulse width modulation (PWM), Pulse position modulation (PPM),Pulse code modulation (PCM)

Class Schedule:

Lecture: 3 one-hour periods per week

Tutorials/Lab: one two hours lab and one-hour tutorial sessions per week

Course Contribution to Professional Component:

Engineering Science: 85 %
Engineering Design: 15 %

Course Relationship to Program Outcomes:

	Engineering Criteria											**Program Criteria**					
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**			
Average attainable level of learning (*)	M	M	H	M	H								M				

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Abdullah Dobaie

Last Updated: October 2007

EE 331 – PRINCIPLES OF AUTOMATIC CONTROL (4,3,2) 4 Credits
(Core course offered in fall and spring terms)

Bulletin Description: Introduction to control systems with examples from different fields. Transfer functions and block diagram algebra. Stability analysis (Routh-Hurwitz and Nyquist). Design of Control Systems using Bode diagrams and root locus techniques

Prerequisites: MATH 204, EE 300, and EE 301

Textbooks: B.C. Kuo, Automatic Control Systems, 7th ed., Prentice-Hall, 1995.

References: K. Ogata, Modern Control Engineering, 3rd ed, Prentice Hall, 1991

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. describe some practical examples and draw the corresponding block diagram
2. explain the difference between the open and closed loop control system
3. apply the MATLAB in solving mathematical problems
4. develop mathematical models (differential equations, state - variables, transfer functions) for a variety of dynamic physical systems
5. apply the theory of Signal Flow Graph in finding the transfer function of the systems
6. analyze the control system using the state - variables approach
7. analyze the control system in the time domain (steady state error and transient response)
8. analyze the stability of linear control system using (direct method, Routh - Hurwitz Test, and the Root Locus plot)
9. designing feedback control systems
10. gain experience in technical writing, and improve communication skills

Course Topics:

1. Introduction (1 week)
2. Mathematical Background (2 weeks)
3. Transfer Function, Block Diagram, and Signal Flow Diagram (2 weeks)
4. Modeling of Physical Systems (2 week)
5. State Variable (2 weeks)
6. Time Domain Analysis (1 week)
7. Stability of Linear Control Systems (1 week)
8. Root Locus Techniques (2 weeks)
9. Designing of feedback systems (2 weeks)

Class Schedule:

Lecture: two of one-and-a-half hour lectures per week
Tutorials: a two-hours lab/tutorial per week

Course Contribution to Professional Component:

Engineering Science: 90 %
Engineering Design: 10 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria					
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**			
Average attainable level of learning (*)	L		M		M		M				M		M	M			

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Prof. Dr. Ali Hasan Bamani

Last Updated: October, 2007

EE 332 – Computational Methods in Engineering (3,3,1) 3 Credits
(Core course offered in fall and spring terms)

Bulletin Description: Introduction, The IMSL library, Solution of non-linear equations- solution of large systems of linear equations, Interpolation, Function approximation, Numerical differentiation and integration, Solution of the Initial value problem of ordinary differential equations. Circuit applications

Prerequisites: EE 201 - Structured Computer Programming, MATH 204 - Differential Equations

Textbooks: R. L. Burden and J. D. Faires, Numerical Analysis, 7th Ed., Brooks/Cole Pub Co., 2000

References: J. R. Rice, Numerical Methods, Software, and analysis, 2nd ed, McGraw-Hill, 1992

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. describe concepts and techniques for numerical analysis, methods and algorithms
2. define solutions of equations in one variable
3. define solutions of equations in multi variables
4. apply the curve fitting method for experimental data
5. define the numerical differentiation and integration
6. apply the initial value problem
7. solve simple problems given at the end of each topic using hand and scientific calculator
8. apply the various learned algorithms and methods using structured programming

Course Topics:

1. Mathematical Backgrounds (1 week)
2. Solution of Equations in One Variable: The Bisection Algorithm, Fixed Point Iteration, The Newton Raphson Method, The Secant Method (2 weeks)
3. Direct Methods of Equations: Linear System of Equations, Gaussian Eliminations and Backward Substitution and Gauss-Jordan Methods, Linear Algebra and Matrix Inversion, The Determinant of a Matrix, Iterative Techniques for Solving Linear Systems (Gauss-Siedel Algorithm) (3 weeks)
4. Numerical Solutions of Nonlinear Systems of Equations: Fixed Points for Functions of Several Variables, Newton's Method (2 weeks)
5. Curve Fitting: Lagrange Method, Divided-Difference Method, Discrete Least Squares Approximation (2 weeks)
6. Numerical Differentiation and Integration: Numerical Differentiation, Numerical Integration, Composite Numerical Integration (2 weeks)
7. Initial Value Problems (Single and Multi-Variables: Euler Method, 2nd-order Runge-Kutta Method, 4th-rder Runge-Kutta Method (2 weeks)

Class Schedule:

Lecture: Lecture: two one and half hours sessions per week
Tutorials: Laboratory / tutorials: one two hours session per week

Course Contribution to Professional Component:

Engineering Science: 75 %
Engineering Design: 25 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria					
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**
Average attainable level of learning (*)	L	M	H	H	M	M	H	M	M		M		M	M			

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. M. Alfheid

Last Updated: December 2007

EE 360 – DIGITAL DESIGN I (4,3,2) 4 Credits
(Core course offered in fall and spring terms)

Bulletin Description: Digital Design I is a study of the basic principle of logic design. It enables the student to apply switching theory to the solution of the logic design problems, network design using a variety of algebraic and graphical techniques such as Boolean Algebra and Karnaugh Maps among others. A wide variety of multiple-output networks such a MUX, Decoder, ROM, and PLA are made handy to the student for designing complex combination networks. Special emphasis on the study of flip-flops memory devices enables the student to design several sequential network such as counters, code converters, shift registers and similar networks.

Prerequisites: EE 311

Textbooks: Charles H. Roth Jr., Fundamentals of Logic Design, 4th Ed. Thomson Brooks, 2004. ISBN: 0534 37804 4

References: M. Mano, Digital Design, Prentice Hall Inc., 2002

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. describe and convert the different number systems and codes
2. apply various techniques to simplify Boolean functions
3. design multi-level and multiple output gate networks
4. use multiplexers and decoders to design basic combinational circuits
5. design a ROM to realize given Boolean functions
6. design a PLA to realize given Boolean functions
7. design combinational Networks
8. compare between the functions of different Flip-Flops, their merits and applications
9. use Flip-Flops to design digital Counters
10. design shift registers and similar sequential networks
11. design and implement sequential networks such as counters, code converters, shift registers and similar networks
12. use software tools to design, simulate, test, and document digital systems

Course Topics:

1. Number systems and codes
2. Boolean Algebra, Logic Gates, Karnaugh Maps
3. Mutli-level gate network, Multiple output networks
4. Multiplexers, Decoders
5. Read-only memories (ROM), Programmable Logic Arrays (PLA)
6. Design of Combinational Networks
7. Flip-Flops, Design of Digital Counters
8. Design of Shift Registers and similar Sequential Networks

Class Schedule:

Lecture: two 1.5 hour sessions per week
Tutorials: One two lab/tutorial hours per week

Course Contribution to Professional Component:

Engineering Science: 75 %
Engineering Design: 25 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria					
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**			
Average attainable level of learning (*)	M	H	H		H	L	H		L		H		H	M			

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Adnan Kaki

Last Updated: October 2007

EE 361 – Digital Computer Organization (3,3,1) 3 Credits
(Core course offered in fall and spring terms)

Bulletin Description: Basic structure of computers. Addressing methods and machine programs. Instruction sets and their implementation. Central Processing Unit. Micro programmed control. input-Output Organization. Arithmetic Unit. Main memory. Computer peripherals and interfacing

Prerequisites: EE 305, EE 360, IE 331

Textbooks: W. Stallings, Computer Organization and Architecture, 6th ed, Pearson Education, 2003

References: M. Mano, Computer Systems Architecture, Prentice-Hall Inc., 2002

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

2. **describe the basic processor architecture**
3. **translate a computer design specification into a register transfer language description**
4. **design the control unit of a computer**
5. **design a basic virtual memory management unit using the concept of one-level and two-level address translation algorithms**
6. **design the data path of a computer from its register transfer language description**
7. **design a basic cache memory with basic organizational techniques and performance tuning**
8. **design an I/O subsystem supporting processor programmed I/O, direct memory access, and interrupt structures**
9. **describe the basic concepts involved in a floating point unit that supports the IEEE floating-point standard: representable numbers of a format, rounding, underflow, special symbols, and exceptions**

Course Topics:

17.

Class Schedule:

Lecture: There are three hours of lectures per week.

Tutorials: There are two hours of lab per week.

Course Contribution to Professional Component:

Engineering Science: 75 %

Engineering Design: 25 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria					
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**
Average attainable level of learning (*)	M	M	H		H				L		H	H	H	H			

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Ahmed Adas

Last Updated: December, 2006

EE 364 – Advanced Programming (3,3,1) 3 Credits
(Core course offered in spring term)

Bulletin Description: Structured programming concepts and control structure. Systematic program design. Modularization and scope concepts. Use of a variety of data structures and programming techniques. Iteration and recursion. Memory management. Program correctness, informal verification and testing

Prerequisites: EE202 - Object-Oriented Computer Programming

Textbooks: Computing Concepts with C++ Essentials (second edition). Cay Hortsmann, John Wiley & Sons, New York, Third Edition, 2003

References: M. Mano, Digital Design, Prentice Hall Inc., 2002

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. apply Problem solving techniques
2. use fundamental programming constructs
3. develop recursive procedures
4. develop programs using object-oriented programming
5. test and debug programs
6. use dynamic data structures
7. apply inheritance and polymorphism in programming
8. build user interfaces

Course Topics:

1. Review of Programming Concepts (1 week)
2. Fundamental programming concepts: Number types, I/O, Assignment, Arithmetic, Strings, Conditional Statements, Iteration, Block Scope, Functions, Arrays, and Vectors.
3. 2. Objects (2 weeks)
4. Constructing Objects, Using O's, Real-Life O's, Graphical Shapes Display, Coordinate System, I/O in Graphical Windows.
5. 3. Recursive Functions (1 week)
6. Recursive Definitions, Mathematical Recursive Functions, String Recursive Functions, Recursive Search and Sorting Functions, Tower of Hanoi.
7. 4.Testing And Debugging (1 week)
8. Unit Tests, Selecting Test Cases, Assertions, Program Traces, Debuggers and their limitations.
9. 5. Classes (2 weeks)
10. Discovering Classes, Interfaces, Encapsulation, Member Functions, Default Constructors, Constructors With Parameters, Accessing Data Fields, Member Functions vs Nonmember Functions, OOD.
11. 7. Streams (1 week)
12. Reading & Writing Text Files, String Streams, Command Line Arguments, and Random Access.
13. 9. Data Structures (1 week)
14. pointers and linked lists.
15. 10. Inheritance (2 week)
16. Derived classes, constructors, member functions, polymorphism, virtual functions.
17. 11. Advanced Object Oriented Programming Concepts (1 week)
18. Operator Overloading, Automatic memory management, Templates, Nested Classes, and Name Spaces
19. 12. Graphical User Interfaces (1 week)
20. WxWindows, Frames, Controls, Menus, Event Handling, Mouse Movement, Dialogs.

Class Schedule:

Lecture: There are three hours of lectures per week.

Tutorials: There are two hours tutorial per week.

Course Contribution to Professional Component:

Engineering Science: 50 %

Engineering Design: 50 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria		
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**
Average attainable level of learning (*)	M		M		M	M	M	M			M		M	

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. M. Al-Jiffry

Last Updated: December, 2006

EE 367 – Data Structures and Algorithms (3,3,1) 3 Credits
(Core course offered in fall and spring terms)

Bulletin Description: Basic concepts of data and their representations inside a computer (scalar, structured, structured and dynamic), Manipulation of arrays, strings, stacks, queues, linear lists, orthogonal lists, trees and graphs. Sorting and searching algorithms. File organization and file access methods

Prerequisites: EE 305 - Discrete Mathematics and its Applications, EE 364 Advanced Programming, and better than average skills in C++ Programming

Textbooks: Data Structures and Other Objects Using C++ (Third Ed.), by M. Main & W. Savitch, Addison-Wesley, 2004

References:

1. Course notes, handouts, web pages, etc (http://engg.kaau.edu.sa/~aqasimi/courses/ee367)
2. Data Structures and Other Objects Using C++ (2nd Ed.), by M. Main & W. Savitch, Addison-Wesley, 2001.
3. Data Structures and Program Design, Third Edition, by R. L. Kruse, Prentice-Hall, 1994.
4. C++ Plus Data Structures, 3rd Ed., by Nell Dale, Jones and Bartlett Computer Science, 2003.
5. Any other books on the subjects of C++ programming and/or Data Structures using C++.

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. explain the concepts of data structures
2. apply methods of performance evaluation to assess different algorithms used in different data structures
3. review C++ programming features that support flexible reusable data structures
4. classify Methodologies used to store data for processing in modern computer systems like Arrays, classes and dynamic data allocation methods
5. define abstract data types
6. implement an abstract data types or structures
7. analyze algorithms used for searching and sorting
8. describe the different methods of sorting and searching
9. write stack and queue applications
10. assess recursive algorithms
11. apply lists, linked lists, trees, binary trees and tables to write efficient searching and sorting algorithms

Course Topics:

1. Introduction to data structures
2. Analysis of Algorithms
3. Arrays, Pointers and Classes in C++
4. Abstract Data Types and Objects
5. Stack, Queue and Priority Queue structures
6. Vectors, Lists, and Sequences (Contiguous and Linked)
7. Recursion
8. Trees and Heaps
9. Tables
10. Searching and Sorting algorithms

Class Schedule:

Lecture: Saturday and Monday 11:00 - 12:30
Tutorials: Please register for lab hours in the PC lab, Room 228, Building 42-A

Course Contribution to Professional Component:

Engineering Science: 50 %

Engineering Design: 50 %

Course Relationship to Program Outcomes:

	Engineering Criteria											**Program Criteria**					
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**
Average attainable level of learning (*)	M	L	M		M				H		H	H	H	M			

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Abdulghani M. Al-Qasimi

Last Updated: December, 2006

EE 411 – DIGITAL ELECTRONICS (4,3,3) 4 Credits
(Core course offered in both Fall and Spring term)

Bulletin Description: Switching of electronic devices. Integrated circuit gates, multivibrators, registers, charge coupled device. Memories. Digital to analog and analog to digital converters.

Prerequisites: EE 311, EE 360

Textbooks: Weste & Harris, CMOS VLSI Design: A Circuits and Systems Perspective, Addison Wesley, 3rd ed, 2005.

References: M. Morris Mano, Digital Design, 3rd ed, Prentice Hall; 2001.

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. map gate level designs into transistor level in different logic families
2. describe the general steps required for processing of CMOS integrated circuits
3. have an understanding of the characteristics of MOS transistors
4. estimate and optimize combinational circuit delay using RC delay models and logical
5. estimate and optimize interconnect delay and noise
6. design for higher performance or lower area using alternative circuit families
7. describe and avoid common CMOS circuit pitfalls and reliability problems
8. use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnects
9. create models of moderately sized CMOS circuits that realize specified digital functions
10. apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality and timing
11. understand the concepts and techniques of modern integrated circuit design and testing (CMOS VLSI)
12. have experience designing and simulating integrated circuits using Computer Aided Design (CAD) tools
13. complete a significant VLSI design project having a set of objective criteria and design constraints
14. estimate and optimize circuit area

Course Topics:

Topic	Weeks in teaching
1. MOS Transistors	1.0
2. CMOS Logic	1.0
3. CMOS fabrication and layout	1.0

4.	CMOS ideal I-V characteristics	1.0
5.	CMOS C-V characteristics	0.5
6.	CMOS nonideal I-V effects	1.0
7.	DC transfer characteristics	0.5
8.	Switch-level RC delay models	1.0
9.	Delay estimation	1.0
10.	Logical effort and transistor sizing	1.0
11.	Interconnect delay estimation	0.5
12.	Wire engineering	0.5
13.	Combinational circuit design	2.0
14.	Sequential circuit design	1.0
15.	verilog simulation tool	0.5
16.	magic layout tool	0.5

Class Schedule:

Lecture: two one and half hours sessions per week

Tutorials/Lab: one two hours session per week

Course Contribution to Professional Component:

Engineering Science: 60 %

Engineering Design: 40 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria		
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**
Average attainable level of learning (*)			M		M						M	M	M	

* L: Objective addresses outcome slightly, M: Moderately, H: Substantially

Prepared by: Dr. Mohammad H. Awedh

Last Updated: June, 2008

EE 390 – SUMMER TRAINING (10 weeks) (2,0,0) 2 Credits
(Core course offered in every summer)

Bulletin Description: Training in industry under the supervision of a faculty member. Students have to submit a report about their achievements during training in addition to any other requirements as assigned by the department.

Prerequisites: EE 321, EE 331, IE 331

Textbooks: None.

References: None.

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. Formulate an objective or mission statement that identify the real problem and describe the expected outcomes of the training activity.
2. Break-down a work environment into its units and work functions, and describe how these units are assembled into a whole entity.
3. Describe a professional organizational structure, its size and how it is related to its main products and to market issues.
4. Exhibit integrity, punctuality, and ethical behavior in engineering practice and relationships.
5. Demonstrate enthusiasm and business focusing.
6. Establish successful relationships with team members, advisors, and clients to understand their needs and to achieve or exceed agreed-upon quality standards.
7. Maintain focus to complete important tasks on time and with high quality, amidst multiple demands
8. Relate practical work to previous knowledge from basic sciences, engineering fundamentals, and discipline related courses.
9. Collect and review related data such as technical information, regulations, standards, and operational experiences from credible literature resources
10. Utilize prior knowledge, independent research, published information, and original ideas in addressing problems and generating solutions
11. Monitor achievement, identify causes of problems, and revise processes to enhance satisfaction
12. Communicate, clearly and concisely, training details and gained experience, both orally and in writing, using necessary supporting material, to achieve desired understanding and impact.

Course Topics:	Duration in weeks
1. Acquainting the trainee by the company, its work environment, organizational structure, products, costumers, engineering units, and quality system.	2
2. Familiarizing the trainee of one production or design unit with deep understanding of the work environment, regulations, standards, etc...	**1**
3. Allocating the trainee to a project team and allowing him to study and collect necessary data about the project using internal and external data sources.	**1**
4. Working as a team member to execute assigned tasks with the following objectives: 1. Apply engineering practices related to his specialization. 2. Enhance team work skills. 3. Relate practical work to his engineering knowledge. 4. Use modern engineering tools such as equipment and computer software. 5. Use project management techniques. 6. Complete assigned tasks on time with high quality. 7. Develop personal communication skills.	**6**

Class Schedule:

Lecture:

Tutorials/Lab: Oral Presentation after submitting a written training report; both evaluated by at least 2 faculty members

Course Contribution to Professional Component:

Engineering Science:

Engineering Design: 100 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria					
P Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**
Average attainable level of learning (*)			M	M	M	H	H	M	M	M	H						

* L: Objective addresses outcome slightly, M: Moderately, H: Substantially

Prepared by: Dr. Bahattin Karagözoğlu

Last Updated: June 2008

EE 460 – Digital Design II (4,3,2) 4 Credits
(Core course offered in spring term)

Bulletin Description: Review of flip-flops. Design of sequential networks. Design of state diagrams, State and transition tables. Analysis of signal tracing and timing charts. Design of iterative networks. Derivation of State equations for sequential and iterative networks. Elimination of redundant states. Design of arithmetic circuits. Hazards avoidance for logic circuits.

Prerequisites: EE 305 - Discrete Mathematics and their Application,
EE 360 - Digital Design I

Textbooks: Charles H. Roth Jr., Fundamentals of Logic Design, 4th Ed. Thomson Brooks, 2004. ISBN: 0534 37804 4

References: Hand outs, notes, etc.

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. describe the difference between digital and analog system
2. describe the difference between combinational and sequential circuits
3. design sequential networks using state tables, state graphs, and K-maps
4. design iterative networks using state tables, state graphs, and K-maps
5. apply state reduction and assignment methods
6. design code converters and pattern detectors
7. design Arithmetic circuits with registers
8. describe static and dynamic hazards and their avoidance in logic circuits
9. use software tools to design, simulate, test, and document digital systems
10. use VHDL to synthesize combinational and sequential circuits
11. use programmable components (e.g., FPGA) to design digital systems

Course Topics:

1. Review of flip-flops (1 week).
2. Design of sequential networks using state tables, state graphs, and K-maps for various examples (2 weeks).
3. Design of iterative networks using state tables, state graphs, and K-maps for various examples (2 weeks).
4. State reduction and assignment methods (1 weeks).
5. Design of code converters and pattern detectors (2 weeks).
6. Design of Arithmetic circuits with registers (1 weeks).
7. Study of static and dynamic hazards and their avoidance in logic circuits (1 weeks).
8. Study of VHDL and FPGA and their use in digital system design (2 weeks)

Class Schedule:

Lecture: There are three hours of lectures per week. Attend all lectures.
Tutorials: There are two hours of lab per week, compulsory to attend.

Course Contribution to Professional Component:

Engineering Science: 50 %
Engineering Design: 50 %

Course Relationship to Program Outcomes:

	Engineering Criteria											**Program Criteria**					
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**			
Average attainable level of learning (*)	M	M	M		M	M		M	M	M	M	L	M	M			

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Muhammad Shafique Shaikh

Last Updated: December 2006

EE 461 – Microprocessors and Microcomputers (4,3,2) 4 Credits
(Core course offered in fall term)

Bulletin Description: Technology, architecture and applications of microprocessors. Programming and structure of microcomputer systems. Memory, Inut/Output and Interrupts. LSI Interface/control chips.

Prerequisites: EE 361 – Digital Computer Organization, EE 460 – Digital Design II

Textbooks: W. A. Triebel and A. Singh, *The 8088 and 8086 Microprocessors*, 4^{th} Ed., Prentice Hall, 2003.

References:

- Berry B. Brey, *The Intel Microprocessors*, 5th Ed. 2000
- A. Singh and W. A. Triebel, *16 and 32 bit Microprocessors*, Prentice Hall, 1991.
- Handouts, and data sheets

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. understand the structure and operational characteristics of the 8086 microprocessor
2. understand the 8086 processor's instructions and addressing modes
3. understand the hardware concepts of a microprocessor and peripherals
4. develop assembly language programs for implementing mathematical and logical operations and decision-making logics
5. understand address decoding circuits for memory systems and peripheral devices
6. understand hardware and software of other microprocessors/microcontroller like 68000 or PIC
7. design a microcomputer system at block diagram level
8. use program development software tools to debug and test assembly programs
9. work in a group, share experience and knowledge, keep-up individual responsibility and communicate professionally and effectively-with the group members
10. prepare technical report on the given problems

Course Topics:

1. Introduction about microprocessors and microcomputer (1 week)
2. Study of 8086 microprocessor internal architecture (2 week)
3. Study of 8086 assembly language (2 week)
4. Solve different problems using 8086 assembly languages (2 week)
5. Study of hardware architecture of 8086 microprocessor (2 week)
6. Study of memory concepts and interfacing (1 week)
7. Study of Input and output concepts (1 week)
8. Study of other microprocessor/microcontroller like 68000 and PIC (3 week)
9. Study modern programming tools (0.5 week)
10. Project (0.5 week)

Class Schedule:

Lecture: There are three hours of lectures per week. Attend all lectures.
Lab/Tutorial: There are two hours of lab per week, compulsory to attend.

Course Contribution to Professional Component:

Engineering Science: 50 %
Engineering Design: 50 %

Course Relationship to Program Outcomes:

	Engineering Criteria											**Program Criteria**					
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**			
Average attainable level of learning (*)	L	H	M		M	M	H	M	M	M	M		M				

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Muhammad Shafique Shaikh

Last Updated: September, 2006

EE 462 – Computer Communication Networks (3,3,1) 3 Credits
(Core course offered in spring term)

Bulletin Description: Components of data communication systems. Error detection techniques. Network Protocols including the Open System Inter-connection model. Communication carrier facilities. System planning considerations.

Prerequisites: EE 321 - Introductions to Communications, EE 361- Ditital Computer Organization

Textbooks: Behrouz A. Forouzan, Data Communications and Networking, 4th Ed.

McGraw Hill, 2007.

References: Larry L. Peterson and Bruce S. Davie, Computer Networks A Systems

Approach, 3rd Ed. Elsevier, 20

Douglas E. Comer, Computer Networks and Internets with Internet

Applications, Prentice Hall, 2003.

Anderw S. Tanenbaum, Computer Networks,4th Ed., Prentice Hall,

2002.

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. describe networking elements, topologies, protocols and cabling
2. describe the 7 layer OSI model, IPv4, 5 layer TCP/IP model
3. describe how multiplex different traffic flows into one single link
4. describe the different transmission media
5. describe switched networks
6. describe error and flow control
7. describe Local Area Networks and Wide Area Networks
8. describe the Internet and the concept of Internetworking
9. describe the IP protocol and other helpful protocol at the Network layer
10. describe the different Routing protocols
11. describe the different protocols at the Transport layer
12. Describe the most popular Application layer protocols
13. define the basic network security elements
14. use OPNET to do performance evaluation for a network design
15. describe how network monitoring is done
16. write small client/server programs

Course Topics:

1. - Introduction.
2. - Network models.
3. - Multiplexing.
4. - Transmission media.
5. - Switching.

6. - Error detection and correction
7. - Local area networks.
8. - Wide area networks.
9. - Internetworking.
10. - Process to process delivery.
11. - Application layer.
12. - Network security.
13. - Network monitoring.
14. - Network Programming

Class Schedule:

Lecture: 3

Tutorials: 2

Course Contribution to Professional Component:

Engineering Science: 50 %

Engineering Design: 50 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria		
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**
Average attainable level of learning (*)	M	M	M	M	M	H	M	M	M	H	H			

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Abdullah S. Balamesh

Last Updated: December, 2006

EE 463 – Operating Systems (3,3,1) 3 Credits
(Core course offered in fall and spring terms)

Bulletin Description: Technology, architecture and applications of microprocessors. Programming and structure of microcomputer systems. Memory, Inut/Output and Interrupts. LSI Interface/control chips.

Prerequisites: EE 364, EE 367

Textbooks: Operating Systems Concepts 6th Edition, by Abraham Silberschatz, Peter Galvin, and Greg Gagne, John Wiley, 2001

References: An Introduction to Operating Systems, by H. M. Deitel, Addison Wesley, 1983

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. define the objectives and functions of modern operating systems
2. describe how operating systems have evolved over time from primitive batch systems to sophisticated Multi-user and Multi-tasking systems
3. describe hardware related components needed to write correct OS
4. identify potential threats to OS from the security point of view and the designed security features to guard against them
5. explain the concepts of processes and threads
6. describe the functions of contemporary OS with respect to efficiency
7. explain the concepts of buffering and spooling
8. contrast between processes and threads
9. analyze the differences between CPU scheduling algorithms
10. describe reasons for using interrupts, dispatching, context switching and preemption to support concurrency in OS
11. apply processor performance evaluation to assess the different CPU scheduling algorithms
12. apply the concepts of semaphores for processes synchronization
13. apply Concurrent programming features of C++ programming language to write concurrent programs
14. explain the different states that a task may pass through and the data structures needed to support Multi-tasks
15. analyze tradeoffs inherent in OS design
16. explain the conditions leading to deadlocks
17. describe methods and algorithms used to deal with deadlocks
18. apply the knowledge acquired about deadlocks and assess which technique is suitable for a given situation
19. compare and contrast different methods of organizing main memory
20. compare and contrast different methods of managing main memory
21. compare and contrast different methods of file organization
22. reformulate the design of paging systems to conform to the different Hardware/Software constraints
23. describe disk-scheduling concepts
24. apply the acquired OS knowledge to compare between different systems

Course Topics:

1. Introduction to Operating Systems (OS).
2. Multiprogramming and Timesharing.
3. Processor Management and Performance Evaluation.
4. Concurrent Processes and Process Synchronization.
5. Concurrent Programming.
6. Deadlock.
7. Storage Organization and Management (Real and Virtual).

8. Disk Scheduling.
9. File Management and Security.
10. Case studies (Unix, MS-DOS, MVS, ...), Time permitting

Class Schedule:

Lecture: Saturday 8:00 AM
Tutorials: Free Hours. Use the Network lab, Room 325, Building 42-A

Course Contribution to Professional Component:

Engineering Science: 50 %
Engineering Design: 50 %

Course Relationship to Program Outcomes:

	Engineering Criteria											Program Criteria		
Program Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**
Average attainable level of learning (*)	M		M		M					H	M	H	H	H

*L: Low level (Knowledge & Comprehension), M: Medium (Application & Analysis), H: High (Synthesis & Evaluation)

Prepared by: Dr. Abdulghani M. Al-Qasimi

Last Updated: December, 2006

EE 499 – SENIOR PROJECT (4,2,4) 4 Credits
(Core course)

Bulletin Description: Selection of topic: literature review; project design planning, arranging for data collection, and experimental work. Experimental work and data collection or field study (if any). Data processing analysis and results. Preparation of the first draft of final report. Presentation of the project.

Prerequisites: EE 321, EE 331, IE 331

Textbooks: B. Karagözoğlu, "A Guide to Engineering Design Methodologies and Technical Presentation", KAU Press, 2008.

References: None.

Course Learning Objectives (CLO)

After finishing the course successfully, the student shall

1. Analyze a project statement, brief, or proposal to identify the real problem and the most relevant needs and operational constraints.
2. Identify potential customers, their needs, and their operational constraints.
3. Collect and review related data such as technical information, regulations, standards, and operational experiences from credible literature resources.
4. Integrate previous knowledge from mathematics, basic sciences, engineering fundamentals and discipline related courses to address the problem.
5. Discuss all applicable realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
6. Define design objectives, measures of design viability, and the evaluation criteria of the final project, and reformulate the problem based on collected data.
7. Generate possible solutions; compare alternatives, and select one alternative based on evaluation criteria and feasibility analysis.
8. Plan an effective design strategy and a project work plan, using standard project planning techniques, to ensure project completion on time and within budget.
9. Implement a planned design strategy for an Experimental Design Project, if applicable:
   - 9.1 Identify experimental variables and parameter with ranges and desired accuracies.
   - 9.2 Select appropriate experimental tools such as sensors, instruments, and software.
   - 9.3 Explain a reliable experimental setup and experimental procedure that solves the problem.
   - 9.4 Explain efficient measures to deal responsibly with safety issues and environmental hazards.
   - 9.5 Use appropriate measurement techniques to ethically collect and record data.
   - 9.6 Analyze experimental data using appropriate tools such as data reduction and statistical analysis.
   - 9.7 Perform uncertainty analysis.
   - 9.8 Judge, verify, and validate the experimental result by comparing them with theory and/or previous experimental works.
10. Implement a planned design strategy for a Product-Based Design Project, if applicable:
    - 10.1 Identify design parameters as well as assumptions.
    - 10.2 Carry out initial design calculations using modern engineering tools.
    - 10.3 Use modern engineering tools to estimate the performance parameters of the initial design.
    - 10.4 Use constraint analysis and trade-off studies of the design parameters to refine the initial design and obtain a final optimized design.
    - 10.5 Evaluate the project related environmental, social, health and safety issues, as well as hazards anticipated by the project.
    - 10.6 Evaluate project success in satisfying customer's needs, design criteria, and operational constraints.
11. Communicate design details and express thoughts clearly and concisely, both orally and in writing, using necessary supporting material, to achieve desired understanding and impact.

12. Demonstrate ability to achieve project objectives using independent, well organized, and regularly reported multi-disciplinary team management techniques that integrate, evaluate, and improve different skills of team members.

Course Topics:	**Duration in weeks**
1. Project selection and team formation	1
2. Problem Definition	2
3. Literature review and data collection	3
4. Problem formulation: - Knowledge integration - Operational and realistic constraints - Design objectives - Evaluation criteria	3
5. Design options and initial layout	2
6. Work plan and budgeting	1
7. Progress report and oral presentation	1
8. Implementation phase	7
9. Design refinement	3
10. Final report and oral presentation	3

Class Schedule:

Lecture: 12 1-hour active learning classes
Tutorials/Lab:

Course Contribution to Professional Component:

Engineering Science:
Engineering Design: 100 %

Course Relationship to Program Outcomes:

	Engineering Criteria											**Program Criteria**					
P Outcomes	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**
Average attainable level of learning (*)	M	H	H	H	M	H	H	M	M	M	H	M	M				

* L: Objective addresses outcome slightly, M: Moderately, H: Substantially

Prepared by: Dr. Bahattin Karagözoğlu

Last Updated: June 2008