Fourth (4^{th}) Year
Semesters 07/08

COMPUTER Option

Course Title: EE313 NETWORK ANALYSIS
Lec.\Rec.\Lab. : 03\00\03 Hours per a week
Class:E 07

-COURSE OUTLINE-

1-INTRODUCTION

-Source and passive elements

2-LAPLACE TRANSFORM,POLES AND ZEROS OF A TRANSFER FUNCTION

3-FUNDAMENTAL PROPERTIES OF A TOW-PORT AND MULTIPORT NETWORKS
- 3-1-Z,Y,h,g and ABCD parameters
- 3-2-Synthesis of lossless tow-port network
- 3-3 -Electric Filters and network interstaging.

4-NUMERICAL ANALYSIS OF LINEAR NETWORKS

5-TIME-DOMAIN ANALYSIS OF LINEAR NETWORKS

6- ANALYSIS AND DESIGN BY S-PARAMETERS

7-NON-LINEAR NETWORK ANALYSIS

8-USE OF SPICE SIMULATOR FOR NETWORK SIMULATION

SPICE is a Simulator Progrm with Integrated Circuits Emphasis

LABORATORY EXPERIMENTS

1-Graph theory.
2-Inductance and Capacitance.
3-Steady state Response of Second-order systems
4-Transient Response of second-order systems.
5-Poles & Zeros of passive networks.
6-Quality Factor.
7-Tranfer functions.
8-Tow-port networks.
9-Multiport feedback and Biquad Active Filters.
10-Butherworth and Chebyshev active Filters.
11-Circuits Analysis using SPICE simulator.

Course title: ***EE322 Digital Systems II***
Lec./Rec./Lab.: ***3/0/3 Hours per week***
Class: ***E06.***

Course Outline

1- TIMING CIRCUITS
- 1.1- Importance of timing circuits
- 1.2- The 555 internal configuration
- 1.3- The 555 as a monostable
- 1.4- The 555 as an astable: -with DC 50-100%, -with DC 0-100%
- 1.5- The 74121 TTL one-shot
- 1.6- The Schmitt trigger

2- MSI COUNTERS & APPLICATIONS
- 2.1- Unidirectional counters
- 2.2- Programmable bi-directional counters
- 2.3- Design of modulo-N counter using Ics.
- 2.4- Applications

3- MSI REGISTERS & APPLICATIONS
- 3.1- Design of shift registers: -SISO, -SIPO, -PISO, -PIPO
- 3.2- The bi-directional shift register.
- 3.3- The universal shift register
- 3.4- Applications

4- STANDARD COMBINATIONAL MODULES
- 4.1- Binary decoders
- 4.2- Binary encoders
- 4.3- Priority encoders
- 4.4- Multiplexers and Vector Multiplexers
- 4.5- Demultiplexers and Vector Demultiplexers
- 4.6- ROMs
- 4.7- PALs
- 4.8- PLAs
- 4.9- Implementation of Boolean expressions using: -Decoders, -Multiplexers, -ROMs, PALs, PLAs
- 4.10- Comparison of different approaches
- 4.11- Arbitrary waveform generation
- 4.12- Keyboard encoding

5- SEMICONDUCTOR MEMORIES
- 5.1- Tri-state devices and principle
- 5.2- Definitions
- 5.3- A 1-bit memory cell: -Static, - dynamic.
- 5.4- Ram architecture:
- 5.5- ROM: -PROM, -EPROM, -EEPROM
- 5.6- Applications:

6- OPTOELECTRONIC DISPLAYS & CHARACTER GENERATOR
- 6.1- Numerical displays
- 6.2- Ripple blanking
- 6.3- Alphanumeric displays
- 6.4- Applications

7- SYNCHRONOUS SEQUENTIAL SYSTEMS

- 7.1- Sequential systems specifications
- 7.2- State diagram
- 7.3- Mealy and Moore architecture model
- 7.4- Analysis of synchronous sequential systems
- 7.5- Design of synchronous sequential systems
- 7.6- Distinguishable and equivalent states
- 7.7- State minimization procedure

8- DAC & ADC CONVERTERS

- 8.1- Amplitude quantization
- 8.2- Time quantizAtion (Sampling)
- 8.3- Digital-to-Analog Converter
- 8.4- Analog-to-Digital Converter

LAB. EXPERIMENTS

- 1- Counters
- 2- Shift registers
- 3- Encoders/decoders, mux/demux
- 4- Timing circuits
- 5- Memory devices
- 6- A/D and D/A conversion

Course title: ***EE332 Power Electronics***
Lec./Rec./Lab.: ***03/00/03 hours per a week***
Class: ***E06***

Course Outline

1-INTRODUCTION TO POWER ELECTRONICS

1.1-Definition of power electronics
1.2-Types of power switches used
1.3-Converter terminology
1.4-Power frequency domains

2-POWER DEVICES

2.1-Power rectifier: Thyristor, TRIAC, gate turn-off switch ;Development of the operation from the Schottkey diode and tow transistor analogy
2.2-Major characteristics and parameters of the devices with particular reference to available device and data sheets
2.3-Thermal performance under normal and fault conditions: this will involve work on heat sinks
2.4-Gating requirements

3-POWER RECTIFICATION

3.1-Single and Three-phase half-wave; full wave center-tapped and bridge circuits
3.2-Development of circuit operation and complete circuit waveforms with R; R & L; back emf loads
3.3-Prediction of differences between ideal and practical circuits
3.4-Operation and use of freewheeling diode
3.5-Summarize the application areas of each circuit and the circuit performance (Vo AVE, Vo RMS., P_{out}, Power factor, ripple factor, harmonic content)

4-CONTROLLED RECTIFICATION PRINCIPLES

4.1-Repeat section 3 with the power rectifier replaced by combinations of power rectifiers and silicon controlled rectifiers
4.2-Phase control principles and the problems of gating ; radio frequency interference, switching transients
4.3-Properties and selection of snubber circuits
4.4-Use of graphical performance curves

5-AC VOLTAGE CONTROL PRINCIPLES

5.1-Principles of phase control: tap-changing and integral cycle control (zero voltage switching)
5.2-Comparison of operational characteristics of the systems
5.3-Use of graphical performance curves for voltage; power and harmonic content
5.4-Compare the merits of the TRIAC with the inverse-parallel SCR arrangement

6-DC-DC CONVERTERS

6.1-Commutation in DC systems and the circuits used to turn off SCR's
6.2-Principles of basic DC chopper circuits with particular reference to waveforms

7-INVERTERS

7.1-Principles of single phase inverters, including series and parallel configurations
7.2-Filters and other techniques used to improve output waveforms

8-FREQUENCY CHANGING

*Principles of cycloconverters and cycloinverters

9-POWER FACTOR CHANGES

*Principles of basic networks for power factor correction

10-POWER CONTROL SYSTEMS

*The principles that have been discussed in the previous sections will now be applied to industrial and commercial systems Areas to include:

10.1-Motor speed control systems
10.2-Lighting systems
10.3-Heater controls

11-PROTECTION SYSTEMS

11.1-Generation and elimination of transients
11.2-Cooling and Heat Sinks
11.3-Selection of fuses to protect devices

LABORATORY EXPERIMENTS

1- a- Use of curve tracer and oscilloscope to display the major characteristics of the SCR; TRIAC
b-Laboratory demonstration of reverse-recovery current
2- a-Display and record all circuit waveforms in single phase rectifier operating in half-wave mode
with R, R & L, back emf and freewheeling diode loads
b-Observe switching transients
c-Measure output parameters
d-Laboratory demonstration of frequency-spectrum
e-Repeat (a) with fullwave center-tapped and bridge networks
3-Repeat (2) for 30 halfwave and fullwave bridge
4-Investigate basic phase-shift networks using C-R and C-R and DIAC networks
5-Repeat (2) with rectifiers replaced with combinations of rectifier and SCR's

6- a-Investigate 1-phase AC phase control using TRIACs and inverse parallel SCR's
b-Note RFI on input waveform
c-Introduce RFI suppression filters
d-Display and record all circuit waveforms and compare circuit performance with available performance data for Po; Vo; harmonics

7- a-Investigate the performance of DC commutation circuits
b-Evaluate the performance of DC chopper

8-Evaluate the performance of basic parallel inverter circuits
9-Light control circuits : investigate:
a-DC flasher
b-AC flasher
c-Ring counter
d-Chaser
e-Lamp dimming systems
Record all circuit waveforms

10-Motor speed control
Open and closed systems for the control of the DC motor and the universal motor

Course Title : EE402 Linear systems II: Discrete-time Signals and Systems
Lec. / Rec. / Lab. : 03 / 00 / 00 Hours per week
Class: E07

Course Outline

Chapter 1: Discrete-time Signals and systems

- 1.1: Review of the properties of discrete time signals
- 1.2: Basic discrete-time signals
- 1.3: Brief Review of the properties of continuous time Linear time- invariant systems

Chapter 2: Discrete -time Linear time-invariant systems

- 2.1: Representation of signals in terms of impulses
- 2.2: Discrete-time LTI systems: The convolution Sum
- 2.3: Properties of the convolution operator
- 2.4: Properties of Linear Time-Invariant Systems:
  - Impulse response and step response
  - Causality, stability, and interconnections of discrete- time LTI systems
- 2.5: Discrete- time systems described by constant coefficients Difference equations:
- 2.6: Poles and zeros of discrete-time LTI systems
- 2.8: Determination of the complete response of LTI systems to given input signals: Methods of solving linear constant coefficients Difference equations
- 2.9: Block-Diagram Representations of LTI systems Described by linear constant coefficients difference equations

Chapter 3: Fourier Analysis for discrete-time signals and systems

- 3.1: Response of discrete-time LTI systems to complex exponentials
- 3.2: Discrete-time Fourier series representation of periodic signals
- 3.3: Discrete-time Fourier transform of aperiodic signals
- 3.4: Discrete-time Fourier transform of periodic signals
- 3.5: Properties of the Discrete -time Fourier Transform and the inverse Fourier Transform
- 3.6: Polar representation of Discrete-time Fourier transform
- 3.7: The frequency response of systems characterised by linear constant-coefficient difference equations
- 3.8: First-Order and Second-Order systems
- 3.9: Determination of the Transfer function, the impulse response, and steady state response from the frequency response

Chapter 4: The Z-Transform

- 4.1: Definition of the Z-transform of a discrete-time signal
- 4.2: The region of convergence of the Z-transform
- 4.3: The Inverse Z-transform
- 4.4: Geometric evaluation of the Fourier Transform from the Pole-Zero Plot
- 4.5: Properties of the Z-Transform
- 4.6: Analysis and characterisation of LTI systems using Z-transform
- 4.7: The unilateral Z-transform

Chapter 5: Sampling of continuous time signals

5.1: Representation of a continuous-time signal by its samples: The sampling theorem
5.2: Reconstruction of a signal from its samples using interpolation
5.3: Sampling in the frequency domain
5.4: Transformations between continuous -time and discrete -time systems

Chapter 6: Introduction to State variable analysis of linear systems

6.1: Derivation of the state variable model of an LTI system: Canonical and Diagonal forms
6.2: Relation between Discrete state model and the finite difference equation
6.3: Discrete state Controllability
6.4: Discrete state observability

Course title: *EE421 Computer Architecture* X
Lec./Rec./Lab.: *3/0/0 Hours per a week*
Class: *E07.*

Course Outline

1-BASIC COMP UTER ARCHITECTURE

1.1- Introduction to assembly language
1.2- Introduction to computer architecture
1.3- Basic building blocks of computer design
1.4- Bus structures
1.5- Data representation: - data types, - floating-point arithmetic

2- REGISTER TRANSFER LANGUAGE

3- ESSENTIALS OF COMPUTER SOFTWARE

3.1- Instruction format
3.2- VAX instruction format
3.3- Addressing modes
3.4- Example programs

4- CPU STRUCTURE

4.1- Basic CPU architecture
4.2- CPU operation
4.3- Implementing complete instructions
4.4- RISC

5- THE ALU STRUCTURE AND OPERATION

5.1- Computer addition and subtraction
5.2- Multiplication and division
5.3- Shift instructions
5.4- Bit manipulation

6- MICROPROGRAMMING

6.1- What is microprogramming ?
6.2- Microprogramming examples
6.3- Microprogram branching

7- MEMORY STRUCTURE

7.1- Memory devices
7.2- Memory organization: - bank, - interleaved
7.3- Cache memory
7.4- Mapping functions: - direct mapping, - associative mapping, - block-set associative mapping
7.5- Virtual memory

8- THE I/O SYSTEM

8.1- Addressing I/O devices
8.2- Data transfer: - Program-controlled I/O, - DMA, - I/O channel
8.3- Interrupt-driven I/O
8.4- Queue I/O
8.5- Advanced I/O devices: - disk drives, -tapes

9- MICROPROCESSORS

9.1- Microprocessors characteristics
9.2- General microprocessor architecture
9.3- The Motorola family
9.4- The Intel family

10- LARGE SYSTEM ARCHITECTURE

10.1- Architecture classification:
10.2- Pipeline structures
10.3- Array structures
10.4- Multiprocessors

11- FAULT-TOLERANT COMPUTER ARCHITECTURE

11.1- Reliability measures
11.2- Hardware redundancy
11.3- Static, dynamic, hybrid

Course title: *EE452 Linear Control Systems* X
Lec./Rec./Lab.: *3/0/3 Hours per week*
Class: *E07*

Course Outline

1- INTRODUCTION TO CONTROL SYSTEMS

- 1.1-History of Automatic Control
- 1.2-Control Engineering Practice
- 1.3-Examples of Modern Control Systems

2- SYSTEM REPRESENTATION

- 2.1-Differential Equations of Physical Systems
- 2.2-Linear Approximations Of Physical Systems
- 2.3-The Laplace transform
- 2.4-The transfer function of Linear systems
- 2.5-Block Diagram models
- 2.6-Signal-Flow graph models
- 2.7-Computer Analysis of Control Systems

3- FEEDBACK CONTROL SYSTEM CHARACTERISTICS

- 3.1-Open-Loop and Closed-Loop Control Systems
- 3.2-Sensitivity of Control Systems to Parameter Variations
- 3.3-Control of Transient Response of Control Systems
- 3.4-Disturbance signals in a Feedback Control System
- 3.5-Steady-State Error

4- THE PERFORMANCE OF FEEDBACK CONTROL SYSTEMS

- 4.1-Time-Domain Performance Specifications
- 4.2-The s-Plane Root Location and the Transient Response
- 4.3-The Steady-State Error
- 4.4-Performance Indices
- 4.5-Second-Order System
- 4.6-The Simplification of Linear Systems

5-THE STABILITY OF LINEAR FEEDBACK SYSTEMS

- 5.1-The Concept of Stability
- 5.2-The Routh-Hurwitz Stability Criterion
- 5.3-The Relative Stability of Feedback Control Systems

6- THE ROOT-LOCUS METHOD

- 6.1-The Root Locus Concept
- 6.2-The Root Locus Procedure
- 6.3-Parameter Design By The Root Locus Method
- 6.4-Sensitivity and The Root Locus

7- FREQUENCY RESPONSE METHODS

7.1-Frequency Response Plots

7.2-Performance Specifications in the Frequency Domain

7.3-Log Magnitude and Phase Diagrams

8- NYQUIST METHOD

8.1-Mapping of Contours in S-Plane

8.2-The Nyquist Criterion

8.3-The Closed-Loop Frequency Response

8.4-The Stability of Control Systems with Time Delays

9-THE DESIGN AND COMPENSATION OF FEEDBACK CONTROL SYSTEMS

9.1-Approaches to Compensation

9.2-Cascade Compensation Network

9.3-System Compensation on the Bode Diagrams Using the Phase-Lead and Phase-lag networks

9.4-Compensation on the s-Plane

9.5- Compensation on the Bode Diagrams Using Analytical and Computer Methods

9.6-The Design of Control Systems in the time Domain

9.7-State-Variable Feedback

LAB. EXPERIMENTS

1- Familiarization
2- Error channel investigation
3- Simple position control system
4- Closed-loop position control systems
5- Simple speed control system
6- Deadband and step response
7- Velocity feedback

Course title: *EE 413 Digital Signal Processing*
Lec./Rec./Lab. : *3/0/0 Hours per a week*
Class: *E08*

Course Outline

1-GENERALITIES ABOUT SIGNALS

2-SEQUENCES AND SYSTEMS
- 2.1-Fourier Transform
- 2.2 -The Sampling Theorem

3-THE Z- TRANSFORM
- 3.1-Definitions & general properties
- 3.2-System Function
- 3.3-Geometric Evaluation of Fourier Transform
- 3.4-Digital Resonator
- 3.5-Digital Oscillator
- 3.6-Basic Filters

4-PROPERTIES OF ANALOG FILTERS
- 4.1-Ideal Frequency-Domain Filter Models
- 4.2-General Approaches
- 4.3-Butterworth Approximation
- 4.4-Chebyshev Approximation
- 4.5-Low-Pass to Band-Pass Transformation
- 4.6-Low-Pass to Band-Rejection Transformation
- 4.7-Low-Pass to High-Pass Transformation

5-SIGNAL FLOW GRAPHS AND IMPLEMENTATION
- 5.1-Generalities about Digital Filter Structure
- 5.2-The Signal Flow Graph
- 5.3-Matrix representation and Analysis
- 5.4-State Space Representation of Digital Filters
- 5.5-Some Particular Structures (Direct Form I, II, Canonic, Cascade, ...)
- 5.6-Finite Impulse Response (FIR) Filters Structures
  - The linear Phase FIR Filter
  - Polynomial Interpolation Structures
  - Frequency Sampling Structures
- 5.7-Implementation of Digital Filters
  - Software Implementation (Vax/Basic & Vax/Fortran)
  - Hardware Implementation
- 5.8-Effect of the Parameter Quantization on Filter Performance

6-DESIGN OF DIGITAL FILTERS

6.1-General Problem of Design

6.2-An Introduction to Approximation (Least square, Min-Max, ...)

6.3-Infinite Impulse Response (IIR) Filter Design

-The Mapping of Analog Designs (Impulse Invariance, Bilinear Transform,...)

-Direct Design (Inverse Least Square Design)

-Examples of Design

7-DISCRETE AND FAST FOURIER TRANSFORMS

7.1-Forms of the Fourier Transform

7.2- Discrete Fourier transform (DFT)

7.3- Fast Fourier transform (FFT)

8-A-PPLICATIONS OF THE DISCRETE FOURIER TRANSFORM

8.1-Approximation of Continuos-Time Transforms with DFT

8.2-Selection of DFT or FFT Parameters

8.3-Convolution with the FFT

8.4-Power Spectrum

9- APPLICATIONS OF DIGITAL SIGNAL PROCESSORS

E422 Microprocessors System Design.

X

Textbook: The Z-80 Microprocesor
Ramesh S. Gaonkar, 3rd Edition.

Lec./Lab./Credit Hours: (3, 3, 4)

Topics

1. Introduction to Microprocessors
   - Microprocessor History and Evolution
   - Microcomputers and Large Frame Systems
   - Microprocessor-Based Systems Architecture

2. Microprocessor Architecture
   - General computer architecture
   - The MPU
   - Input/Output
   - A Comparison of Typical Microprocessors

3. The Z-80 Microprocessor
   - MPU Signal Description
   - Programming Model
   - Memory and I/O Interfacing

4. Z-80 Assembly Language Programming
   - Instruction Set and Machine Language Programming
   - Addressing Modes
   - Introduction to Z-80 Assembly Language and Programming
   - Assemblers and Software Development Tools
   - Stacks and Subroutines
   - Programming Examples

5. Memory Interfacing
   - MPU Timing Diagrams
   - Timing Considerations of Memory Devices
   - Memory Organization and Address Decoding
   - Memory Expansion
   - MT-80AZ Memory Map

6. I/O Interfacing
   - Interrupt Handling Techniques
   - Simple Input/Output Devices
   - I/O Device selection
   - Programmable Interface Devices:
     - Intel PPI 8255
     - Zilog Parallel Input Output (PIO)
     - Zilog Counter Timer Circuit (CTC)

X

7. Direct Memory Access
   - DMA Concepts
   - The Z-80 DMA Structure

8. Microprocessor-Based Communications
   - Introduction to Digital Communication
   - Serial Communication Interface Adapter: The MC6850
   - RS232 C Interface Standard
   - Modems

9. Designing Microprocessor-Based Systems
   - Application Examples

10. Trends in Microprocessors Technology

LAB. EXPERIMENTS

1- Getting Familiar with the MT-80AZ Microcomputer
2- Arithmetic Operations
3- Data Conversion and Manipulations
4- Event Counting and Interrupt Handling
5- I/O Interfacing through the 8255 PPI
6- Waveform Generation (DACs Interfacing)
7- Data Acquisition (ADC Interfacing)

Course title: *EE423 Data Structures*
Lec./Rec./Lab.: *3/0/0*
Promotion: *E08 / Computer.*

Course Outline

1- INTRODUCTION
- 1.1- Computer science
- 1.2- Data types

2- DESCRIPTION LANGUAGE OF ALGORITHMS
- 2.1- Introduction
- 2.2- SPARKS
- 2.3- Creating programs
- 2.4- Examples
- 2.5- Recursion
- 2.6- Analyzing algorithms

3- ARRAYS
- 3.1- Definition
- 3.2- Ordered lists
- 3.3- Sparse matrix
- 3.4- Arrays representation

4- STACKS
- 4.1- Definition
- 4.2- Operations
- 4.3- Evaluation of expressions

5- QUEUES
- 5.1- Definition
- 5.2- Operations

6- LINKED LISTS
- 6.1- Singly linked list
- 6.2- Operations: insertion, deletion
- 6.3- Linked list application;
- 6.4- Storage pool
- 6.5- Polynomial addition
- 6.6- Circular lists
- 6.7- Other operations

7- TREES
- 7.1- Definition and terminology
- 7.2- Binary tree
- 7.3- Binary tree traversal
- 7.4- Nonrecursive algorithm for in order traversal
- 7.5- Examples using binary trees
- 7.6- Threaded binary tree
- 7.7- Transformation of trees into binary trees

8- FILES
- 8.1- Introduction
- 8.2- Occupancy
- 8.3- Order
- 8.4- Fields
- 8.5- Records
- 8.6- Use of a file
- 8.7- Searching
- 8.8- Posting problem
- 8.9- Initial processing of files
- 8.10- Updating
- 8.11- Maintenance

9- SORTING
- 9.1- Introduction
- 9.2- Sorting in memory
- 9.3- External sorting

10- DIRECTORIES
- 10.1- Introduction
- 10.2- Total directory
- 10.3- Linked-list directory file
- 10.4- Single directory
- 10.5- Two-level directory file
- 10.6- More than two-level directory

11- MAPPING
- 11.1- Introduction
- 11.2- Arithmetic mapping

Course title: *EE453 Process Control and Instrumentation.*
Lec./Rec./Lab.: *3/0/3*

Course Outline

1- GENERALITIES OF INSTRUMENTATION & PROCESS CONTROL
- 1.1- Open loop and Closed loop process
- 1.2- Terminology used in dynamics and Control
- 1.3- Elements of process Control
- 1.4- Evaluation of process Control
- 1.5- Analog Control
- 1.6- Digital Control

2- ANALOG SIGNAL CONDITIONING (A.S.C.)
- 2.1- Introduction
- 2.2- General type of A.S.C.
- 2.3- Operational Amplifiers (Op-Amps)
- 2.4- Op-Amps Circuits in Instrumentation
- 2.5- Power Interface.

3- DIGITAL SIGNAL CONDITIONING
- 3.1- Converters
- 3.2- D.A.C: applications, structure and characteristics.
- 3.3- A.D.C: applications, structure and characteristics.
- 3.4- Data Acquisition Systems

4- TRANSDUCERS
- 4.1- Thermal transducer: R.T.D., semiconductors, thermistors.
- 4.2- Thermocouples: principles, types and applications.
- 4.3- Liquid-expansion thermometers, bimetal strips.
- 4.4- Mechanical transducers
- 4.5- Displacement, location and position transducers
- 4.6- Capacitive and inductive
- 4.7- Linear variable differential transformer (L.V.D.T)
- 4.8- Level transducers
- 4.9- Stress-strain measurement.
- 4.10- Strain gage principles
- 4.11- Motion transducers
- 4.12- Accelerometer principles, types
- 4.13- Optical transducers.

5 ELEMENTS IN DIGITAL CONTROL
- 5.1- Control System Parameters
- 5.2- Control Operating Modes
  - Two-position mode
  - Multi-position mode
  - Floating mode
  - Integral mode
  - Proportional mode
  - Derivative mode
- 5.3- Composite control modes (PI mode, PD mode, PID mode)

Course title: *EE454 Digital Control Systems I*

Lec./Rec./Lab.: *3/0/0*

Promotion: *E08 / Computer, Control.*

Course Outline

1- INTRODUCTION TO DISCRETE TIME CONTROL SYSTEMS

- 1.1- Basic Elements of a discrete-Data Control System
- 1.2- Advantages of Discrete-Data Control Systems
- 1.3- Examples of Discrete-Data and Digital Control Systems.

2- REVIEW OF THE Z TRANSFORM

- 2.1- Motivation of using Z-Transform
- 2.2- Relationship between the Laplace Transform and the Z-Transform.
- 2.3- Relationship between the S-plane and the Z-plane
  - 2.3.1- Mapping of the Primary Strip
  - 2.3.2- Mapping of the Constant Frequency
  - 2.3.3- Mapping of the Constant Damping-Coefficient Loci
  - 2.3.4- Mapping of the Constant Damping-Ratio Loci
- 2.4- The Inverse Z-transform
- 2.5- The Delayed Z-transform and the Modified Z-transform

3- Z-DOMAIN ANALYSIS

- 3.1- The Pulse Transfer Function and the Z-transfer Function
- 3.2- Pulse Transfer Function of Zero-order Hold and the Relationship between G(s) and G(z)
- 3.3- Closed-loop Systems
  - 3.3.1- The Characteristic Equation
  - 3.3.2- Causality and Physical Realizability
- 3.4- The sampled signal Flow Graph
- 3.5- The Modified Z-Transfer function
- 3.6- Multirate Discrete-Data systems

4- DESIGN OF DISCRETE TIME CONTROL SYSTEMS VIA TRANSFORM METHODS

- 4.1- Z-Domain Stability
- 4.2- Extended Z-Domain Stability Analysis: Jury's test
- 4.3- Steady State Error Analysis
- 4.4- Routh Locus Analysis
- 4.5- Bilinear Transformation
  - 4.5.1- S and W-plane Relationship
  - 4.5.2- Routh Stability criterion in W-plane
- 4.6- S, Z and W-plane Time Response Characteristics Correlation
- 4.7- Frequency Response
- 4.8- Cascade Compensation by continuous-Data Controllers
- 4.9- Design of Continuous-Data Controllers with Equivalent Digital Controllers.

5- ROOT LOCUS

Fifth (5^{th}) Year
Semesters 09/10

COMPUTER Option

EE521 Programmable Logic Controllers K

Textbook: Programmable Logic Controllers.

Lec/Lab./Rec./Credit Hours: (1h30, 1h30, 1h30, 3)

Topics

1- Introduction to PLCs
    - Microprocessors evolution
    - Micro-controllers
    - Application Specific ICs (ASICs)
    - Application of PLCs

2- PLC Architecture
    - Example Architectures
    - Logic Circuitry
    - I/O Ports
    - RAM/EPROM
    - Power Interface

3- Introduction to Programming
    - Instruction Set
    - Ladder Diagram
    - Programming Examples

4- Advanced PLC Functions
    - Ladder Diagram Simplification
    - Advanced Functions (Timing, Delay)
    - Power Interfacing

5- Advanced PLC Programming
    - Problem specification
    - Problem solving

Course Title: *EE523 Programming Languages* K
Lec./Rec./Lab.: *3/0/3*
Promotion : *E09 / Computer.*

Outline

1- INTRODUCTION

2- LANGUAGE PROCESSORS

3- ELEMENTARY DATA TYPES

4- STRUCTURED DATA TYPES

5- SUBPROGRAMS AND PROGRAM-DEFINED DATA TYPES

6- SEQUENCE CONTROL

7- DATA CONTROL

8- STORAGE MANAGEMENT

9- SYNTAX AND TRANSLATION

10- COMPARATIVE STUDY OF PROGRAMMING LANGUAGES

LAB. EXPERIMENTS

Programming in Basic, Fortran, Pascal, C.

Course title: *EE543 Advanced IC's*
Lec./Rec./Lab.: *3/0/3 Hours per week*
Class: *E09*

Course Outline

1- ADVANCED IC'S INTERFACING THE PC RESOURCES
1.1 The PC resources (processor, memory, I/O, storage)
1.2 System related data (ROM BIOS) and system services (Bios and DOS).

2- DEVELOPMENT TOOLS
2.1 Assembly language
2.2 Turbo C
2.3 System programming using the three levels (registers, BIOS, HLL)
2.4 Debugging techniques and tools

3- THE VGA GRAPHICS CARD
3.1 Architecture and Interfacing of the VGA card
3.2 Graphical concepts (Video RAM, special and color resolution, palette, etc...)
3.3 The VGA graphics card (CRTC MC6845, VGA Processor, Color Registers, Atribute registers, etc...)
3.4 Text mode (attribute & fonts), Graphic mode (Bitplanes, etc...)
3.5 Programming examples in three levels (register, BIOS and C)

4- APPLICATIONS OF THE VGA CARD
4.1 Reading and displaying formatted images using the graphics C library
4.2 Drawing 3D shapes using the graphics library.

5- THE RS232 COMMUNICATION CARD
5.1 Architecture and Interfacing
5.2 Communication concepts (Protocol of communication, Synchronization, etc...)
5.3 The RS232 card (Intel 8251A USART, bus transceivers, DB9 and DB25 connectors)
5.4 Seven-Wire Null modem
5.5 Programming examples in three levels (register, BIOS and C)

6- APPLICATIONS
6.1 Testing faulty ports
6.2 Communication between PC's
6.3 Using the MSDOS interlink & server
6.4 Synchronous communication.

Course Title: *EE524 Operating Systems*
Lec./Rec./Lab.: *3/0/0*
Promotion : *E09 / Computer.*

Outline

1- HISTORICAL PERSPECTIVE TO OPERATING SYSTEMS

2- BASIC STRUCTURE

3- THE KERNEL

4- MEMORY MANAGEMENT

5- INPUT/OUTPUT

6- FILE SYSTEMS

7- RESOURCE ALLOCATION AND SCHEDULING

8- NETWORK AND MULTIPROCESSOR OPERATING SYSTEMS

Course Title: *EE525 Special Topics on Computers (Artificial Intelligence)* X
Lec./Rec./Lab.: *3/0/0*
Promotion : *E10 / Computer.*

<u>Outline</u>

1- INTRODUCTION
- 1.1- What is A.I. ?.
- 1.2- Controversies concerning A.I.
- 1.3- Some central topics in A.I.
- 1.4- Theory versus applications in A.I.

2- FIRST ORDER LOGIC
- 2.1- Syntax
- 2.2- Semantics
- 2.3- Clause forms
- 2.4- Herbrand universe/base
- 2.5- Semantic trees
- 2.6- Unification
- 2.7- The resolution principle
- 2.8- Soundness and completeness of the resolution principle

3- APPLICATIONS OF THE RESOLUTION PRINCIPLE
- 3.1- Automatic theorem proving
- 3.2- Game playing

4- A.I. PROGRAMMING LANGUAGES
- 4.1- Overview of programming languages
- 4.2- Distinctions between a declarative language and a procedural language
- 4.3- Importance of search methods in a declarative language

5- FUNDAMENTALS OF PROLOG
- 5.1- Introduction to Prolog
- 5.2- Horn clauses and Prolog
- 5.3- Clauses, facts and rules
- 5.4- Unification and backtracking in Prolog
- 5.5- Recursion in Prolog
- 5.6- Lists in Prolog.

EE532

Course title : . *Quality Control*
Lec./Rec./Lab. :*3/0/0 Hours per week*
Class: *E10*

Course Outline

1-NATURE AND SCOPE
- 1.1-Introduction
- 1.2-Definitions
- 1.3-Quality control functions
- 1.4-Relationship to Reliability

2-ORGANIZATION
- 2.1-Purpose of Organising
- 2.2-Location within the Total Enterprise
- 2.3-Internal Organisation of the Quality Control

3-PERSONNEL
- 3.1-Introduction
- 3.2-Labor
- 3.3-Engineering and Scientific personnel
- 3.4- Supervisory and Management Personnel

4-TRAINING
- 4.1Training for Labor Positions
- 4.2-Training for Engineering and Scientific Employees
- 4.3-Training for Supervisory and Management Personnel

5-QUALITY SYSTEMS AND PROCEDURES
- 5.1-Requirements for Systems and Procedures
- 5.2-Systems and Procedures Defined
- 5.3- Systems and Procedures Analysis
- 5.4-The Quality Control Manual

6-QUALITY COSTS
- 6.1-Introduction
- 6.2-Classes Of the Firm's Costs
- 6.3-Quality Costs and Losses
- 6.4-Implementation
- 6.5-Accounting for Quality Costs and Losses

7-QUALITY MOTIVATION
- 7.1-Introduction
- 7.2-Elements of Motivation Program
- 7.3-Motivation and Quality Control

8-QUALITY AUDIT

8.1-Systems and Procedures Conformance Audit
8.2-Systems and Procedures Effectiveness Audit
8.3-Product Audit
8.4-Organizing for Audit
8.5-Conducting the Audit
8.6-Reporting Audit Results

9-CONTROL OF ENGINEERING QUALITY

9.1-Engineering's Role in Quality Creation
9.2-Establishing Quality Objectives
9.3-Selection of Quality Characteristics
9.4-Spesification of Quality
9.5-Evluation of Engineering Quality

10-CONTROL OF PURCHASED MATERIAL QUALITY

10.1-Purchasing's Role in Quality Creation
10.2-Make or Buy Committees
10.3-Source Selection
10.4-Source Inspection
10.5-Receiving Inspection
10.6-Corrective Action
10.7-Surveillance of Warehouse and Storage Facilities

11-CONTROL OF MANUFACTURING QUALITY

11.1-Manufacturing's Role in Quality Creation
11.2-Evaluation of the production process
11.3-Measurement and Measuring Equipment
11.4-Process Control
11.5-Inspection
11.6-Acceptance Sampling
11.7-Quality Information
11.8-Packaging

12-ACTION SUPPORTING THE PRODUCT AFTER DELIVERY

12.1-Product Support
12.2-Control of Service Publications
12.3-Control of spare parts
12.4-Modification and Repair
12.5-Field results