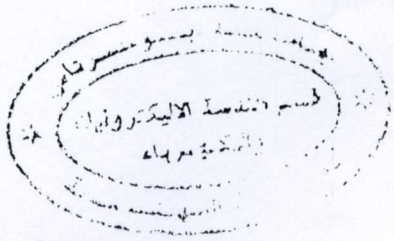
Ministry of Higher Education and Scientific Research

University "M'Hamed Bouguerra"
of Boumerdes

Faculty of Engineering

Department of Electrical and Electronic Engineering
(DGEE)



DEUA Program

OCTOBER 2001

Ministry of Higher Education and Scientific Research

University of Boumerdes
Faculty of Engineering

Tel/Fax: (213) (0) 24 81 83 33

Department of Electrical
& Electronic Engineering

N° /CDGEE/2002

'DEUA' Program

First Year (Common Core)

Semester	Code	Course Title	Credit	Load Lec.	Load Rec.	Load Lab.	LPW	Remark
1	TS111	English I	6	24	0	0	24	24 h/week
2	TS112	English II	3	12	0	0	12	30h /week
	TE101	Electric Circuits I (DC)	3	3	1h30	1h30	6	
	TE171	Applied Mathematics	3	3	1h30	0	4h30	
	TE172	Applied Physics	4	3	1h30	3	7h30	
Total				24/21	0/4.5	0/4.5	24/30	

Second Year (2)

Year	Code	Course Title	Credit	Load Lec.	Load Rec.	Load Lab.	LPW	Remark
II	TT204	Electric Draft and Printed Circuits	2	1h30	0	1h30	3	30 weeks 25h30/week
	TE241	Fundamental and Linear Integrated Electronics.	4	3	1h30	1h30	6	
	TE221	Digital Electronics	4	3	0	3	6	
	TE222	Programming & Numerical Methods	3	1h30	0	1h30	3	
	TE231	Electric Circuits and Machines.	4	3	1h30	1h30	6	
	TE291	Management (Maintenance, Industrial)	2	1h30	0	0	1h30	
Total				13.5	3h	9h	25h30	

University of Boumerdes,
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Third Year (3) DEUA, option : ***Digital.***

Semester	Code	Course Title	Credit	Load Lec.	Load Rec.	Load Lab.	LPW	Remark
5	TE224	Introduction to Computer Technology	3	1h30	1h30	1h30	4h30	15 weeks
	TE321	Microprocessors	4	3	0	3	6	
	TE322	Digital Systems Troubleshooting	2	1h30	0	3	4h30	25h30/week
	TE324	Programmable Controllers	3	1h30	1h30	1h30	4h30	
	TE332	Power Electronics	4	3	0	3	6	
6	TS313	English III (Technical Report Writing)	3	1h30	1h30	0	3	
	TE318	Digital Communications	4	3	0	3	6	14 weeks
	TE323	Industrial Process Control	4	3	0	3	6	
	TE325	Special Topics on Computers	3	1h30	0	1h30	3	18h00/week
	TE382	Project	–	–	–	–	–	
	—	Industrial Training	–	–	–	–	–	
Total				10.5/9	3/1.5	12/7.5	25.5/18	

Third Year (3) DEUA, option : ***Electronic Maintenance.***

Semester	Code	Course Title	Credit	Load Lec.	Load Rec.	Load Lab.	LPW	Remark
5	TE312	Electronic Communications	4	3	0	3	6	15 weeks
	TE321	Microprocessors	4	3	0	3	6	
	TE332	Power Electronics	4	3	0	3	6	28h30 /week
	TE345	Electronic Maintenance and Methodology	4	3	0	3	6	
	TE351	Instrumentation and Metrology	4	3	0	1h30	4h30	
6	TS313	English III (Technical Report Writing)	3	1h30	1h30	0	3	
	TE323	Industrial Process Control	4	3	0	3	3	14 weeks
	TE352	Electronic Equipment Maintenance	2	3	0	0	3	
	TE382	Project	–	–	–	–	–	09h00 /week
	—	Industrial Training	–	–	–	–	–	
Total				15/7.5	0/1.5	13.5/3	28.5/9	

Third Year (3) DEUA, option : ***Power.***

Semester	Code	Course Title	Credit	Load Lec.	Load Rec.	Load Lab.	LPW	Remark
5	TE321	Microprocessors	4	3	0	3	6	15 weeks
	TE331	Power System Components	4	3	0	1h30	4h30	
	TE332	Power Electronics	4	3	0	3	6	28h30 /week
	TE333	Electric Machines	4	3	0	3	6	
	TE336	Electric Design and Drafting	4	3	0	3	6	
6	TS313	English III (Technical Report Writing)	3	1h30	1h30	0	3	
	TE334	Generation/Transmission & Distribution of Electric Energy	4	3	0	3	6	14 weeks
	TE335	Methodology and Maintenance	2	1h30	0	1h30	3	12h00 /week
	TE382	Project	–	–	–	–	–	
	—	Industrial Training	–	–	–	–	–	
Total				15/6	0/1.5	13.5/4.5	28.5/12	

TE101 Electric Circuits I

Year : one
Semester: 02
Credit/Lec./Rec./Lab. 3/3/1.5/1.5

Outline

I- Series and Parallel Circuits

II- General Mesh and Node Analysis

III- Network Theorems

IV- Capacitance Circuits

V- Magnetic Circuits

VI- Inductive Circuits

VII- Sinusoids and Phasors

VIII- Series and Parallel AC Circuits

IX- More Complex AC Circuits

Laboratory:

1- Measurement in DC circuits with analog and digital meters
2- Verification of circuit theorem
3- The oscilloscope and its use to measure simple transients
4- AC measurements of RMS values and phase
5- Verification of circuit theorem in AC circuits
6- Phasor diagrams

TE171 Applied Mathematics

Year : one
Semester: 02
Credit/Lec./Rec./Lab. 3/3/1.5/0

Outline

I- Complex Numbers

II- Graphs of Applied Trigonometric Functions

III- Hyperbolic Functions

IV- Derivatives

V- Applications of the Derivatives

VI- Integration

VII- Applications of Integration

VIII- Functions of Two Independent Variables – Introduction

IX- Differential Equations

X- Laplace Transform

XI- Applications of Laplace Transform

XII- Matrices – Introduction

TE172 Applied Physics

Year : one
Semester: 02
Credit/Lec./Rec./Lab. 4/3/1.5/3

Outline

I- Electromagnetism
- 1.1- Ampere's law
- 1.2- Biot-Savart law
- 1.3- Magnetic fields due to current carrying conductors
- 1.4- Solenoidal currents
- 1.5- Magnetic flux and flux density
- 1.6- Electromagnetic induction

II- Applied Optics
- 2.1- Image formation
- 2.2- Equations
- 2.3- Ray diagrams and aberrations in a thin single lens
- 2.4- Compound lens
- 2.5- Camera F-number
- 2.6- Exposure time, film speed and their relation

III- Thermodynamics
- 3.1- Temperature variation of pressure resistance
- 3.2- Absolute scale of temperature
- 3.3- Conduction of heat
- 3.4- Convection currents
- 3.5- Spectrum and power distribution in black body radiation
- 3.6- Photometry

IV- Waves
- 4.1- Periodic motion
- 4.2- Simple harmonic motion and its characteristics
- 4.3- Graphical representation and equation of simple harmonic motion
- 4.4- Stroboscope, its principle and uses

V- Wave Optic and Atomic Physics
- 5.1- Wave nature of light
- 5.2- Diffraction of light and grating spectrometer
- 5.3- Spectral series
- 5.4- Atomic structure
- 5.5- Energy levels and atomic transitions
- 5.6- Fluorescence

VI- Semiconductor Physics
- 6.1- Structure of solids
- 6.2- Band theory of solids
- 6.3- Semiconductors
- 6.4- Charge carriers – idea of holes
- 6.5- Intrinsic and impurity semiconductors
- 6.6- P-N junction
- 6.7- Forward and reverse bias
- 6.8- Junction transistors

Laboratory

1- Field lines of magnets and force on a solenoid plunger
2- Experimental study of various aspects of image formation by converging lens
3- Temperature variation of resistance and pressure
4- Photometry
5- Use of stroboscope as tachometer and for studying wave motion
6- Measurement of wavelengths of light from different sources of light and phosphors
7- Measurement of resistance of semiconductor diodes in reverse and forward bias

TT204 Printed Circuit Boards

Year : two
Semesters: 03 and 04
Credit/Lec./Rec./Lab. 2/1.5/0/1.5

Outline

I- Printed Circuits Boards
- 1.1- Introduction
- 1.2- Classification of PCB
- 1.3- Insulating base material
- 1.4- Conducting foil
- 1.5- bonding

II- PCB Design and Layout
- 2.1- Grid and reduction factor
- 2.2- Component positioning
- 2.3- Drafting aids
- 2.4- Artwork construction: single sided, double sided

III- PCB Processing
- 3.1- Photographic reduction
- 3.2- Film processing
- 3.3- Photosensitizing PCB, exposure and developing
- 3.4- Etching
- 3.5- Drilling
- 3.6- Surface cleaning
- 3.7- Plating and sealing

IV- Component Assembly
- 4.1- Standard solar terminals
- 4.2- Solder-less terminals
- 4.3- Connectors
- 4.4- Interfacial connections for double sided boards
- 4.5- Component assembly
- 4.6- Device assembly
- 4.7- Device sockets
- 4.8- Heat sinking

V- Soldering
- 5.1- Characteristics of solder and flux
- 5.2- Soldering iron
- 5.3- Soldering technique
- 5.4- Desoldering
- 5.5- Dip and wave soldering

VI- Chassis Mounting
- 6.1- Common hardware and tools
- 6.2- Special hardware and fasteners

Laboratory

1- Space allotment and component positioning
2- Detailed drawing single sided PCB
3- Artwork construction single sided PCB
4- Detailed drawing double sided PCB
5- Artwork construction double sided PCB
6- Project – space allotment and component positioning
7- Project – detailed drawing
8- Project – artwork master
9- Photographic reduction and film processing
10- PCB Photosensitizing, exposure and developing
11- PCB etching and drilling
12- Conductor pattern cleaning and plating
13- Hardware and component assembly
14- Soldering and desoldering
15- Chassis design and fabrication
16- PCB mounting on chassis
17- Interconnection wiring
Testing

EE241 Fundamental and Linear Integrated Electronics

Year : two
Semesters: 03 and 04
Credit/Lec./Rec./Lab. 4/3/1.5/1.5

Outline

Semiconductor Diodes: Characteristics and Parameters of Ideal and Practical

1.1- Signal diode
1.2- Rectifier diode
1.3- Schottky diode
1.4- Zener diode

II- Diode Applications
2.1 Discussion on various uses of diodes
2.2 Principles of rectification with resistive load
2.3 Emphasis on waveforms and device ratings
2.3.1- Single phase: half wave, full wave center tap, full wave bridge
2.3.2- Three phase: half wave
2.4 Circuit performance figures: ripple factor, etc…

III- Principles of Simple Smoothing Circuits

IV- Zener Diode Regulator
4.1- Zener regulator circuits
4.2- Emphasis on the practical variations from the ideal device and ratings

V- Transistors
5.1- Operation and characteristics of bipolar and F.E.T. devices
5.2- Device parameters and manufacturer's data sheets
5.3- Emphasis on the different parameter specifications for amplification, switching, high frequency operation
5.4- Transistor equivalent circuit including high frequency effect
5.5- Transistor modes of operation
5.6- Darlington connection

VI- Transistor Applications
6.1- Discussion on the various uses of transistors
6.2- Principles of amplification
6.3- Basics of class "A", "B", and "C" amplifiers
6.4- Brief discussion on bias networks
6.5- AC/DC load lines techniques: resistive and transformer coupled loads

VII- Class A Amplifiers
7.1- Principles
7.2- Distortion
7.3- Efficiency
7.4- Thermal performance of devices
7.5- Amplifier specification: Zin, Zout, A_V, A_I, A_P
7.6- Decibel (dB) notation

VIII- Principles and Use of Integrated Circuits (ICs)

IX- Integrated Circuit Amplifiers
- 9.1- Audio
- 9.2- Power
- 9.3- High frequency

X- Negative Feedback
- 10.1- Network interconnection with reasons and performance
- 10.2- Effects of negative feedback on
  - 10.2-1. Gain and gain stability
  - 10.2-2. Distortion
  - 10.2-3. Bandwidth
  - 10.2-4. Noise

XI- Operational Amplifiers
- 11.1- Characteristics of ideal and practical op-amps
- 11.2- Summary of available op-amps
- 11.3- Modes of op-amp operation: inversion, non-inversion, differential
- 11.4- Performance calculations of simple circuits
- 11.5- Practical characteristics of op-amps
  - 11.5-1. Frequency compensation
  - 11.5-2. Voltage and current offset
  - 11.5-3. Drift
  - 11.5-4. Slew rate

XII- Op-Amps Applications
- 12.1- Discussion on the various applications of op-amps
- 12.2- Discussion on particular circuits
  - 12.2-1. Adders
  - 12.2-2. Multipliers
  - 12.2-3. Integrators
  - 12.2-4. Linear and nonlinear gain control
  - 12.2-5. Unity follower
  - 12.2-6. Audio mixing
  - 12.2-7. Log amplifier
  - 12.2-8. Active rectifier circuits
  - 12.2-9. Current-voltage converters
  - 12.2-10. Voltage-current converters
  - 12.2-11. Phase shift networks
  - 12.2-12. Low pass active filters
  - 12.2-13. High pass active filters

XIII- Class B Amplifiers
- 13.1- Transformer coupled push-pull amplifier
- 13.2- Cross-over distortion and how to reduce it
- 13.3- Mathematical representation of power and efficiency
- 13.4- Transistor dissipation and the selection of heat sinks
- 13.5- Comparison between push-pull using single and "split" power supplies
- 13.6- Bias networks for class A-B using resistors, diodes and op-amps

13.7- Complementary-symmetry and quasi complementary-symmetry output stages including Darlington connections
13.8- Effects of matching and mismatching amplifier to load
13.9- Short circuit and overload protection
13.10- IC power amplifier

XIV- Class C Power Amplifiers
14.1- Principles of class C
14.2- Tuned class C circuits
14.3- Mathematical representation of power and efficiency
14.4- Transistor dissipation

XV- Power Supplies
15.1- Smoothing networks for rectifier circuits
15.2- Block diagram of regulated power supply
15.3- Principles of transistor series and shunt regulators
15.4- Power supply specifications: regulation, efficiency, ripple, output impedance
15.5- Methods of measurements of specification parameters
15.6- Effects of open circuit and short circuit load conditions
15.7- Current limiting networks
15.8- Ripple reduction networks
15.9- Use of Darlington interconnection
15.10- Feedback loops with discrete devices and op-amps
15.11- Thermal problems and heat sink selection

XVI- IC Voltage Regulators
16.1- Survey of available ICs: fixed and variable voltage regulators
16.2- Heat sink selection
16.3- Application of IC regulators: current source, high current regulators, adjustable output voltage from fixed IC regulator, variable output voltage from fixed IC regulator, high output voltage regulator, high input voltage regulator, dual tracking regulator
16.4- IC regulator protection: current limiting shutdown, thermal shutdown

XVII- Oscillators
17.1- Principles of positive feedback
17.2- Barkhausen conditions for oscillation
17.3- Frequency selective network
17.4- Gain/frequency and phase/frequency plots
17.5- Principles of operation of the oscillators:
17.5-1. RC phase shift
17.5-2. Wien-bridge
17.5-3. Hartley
17.5-4. Colpits
17.5-5. Crystal
17.6- Comparison between discrete and op-amps circuits
17.7- Automatic gain control circuits

Laboratory

1- Diode characteristics
2- Single phase rectifier circuits with resistive loads
3- Zener diode regulator
- Bias networks
- Class "A" transistor amplifier
- Effects of negative feedback on class A amplifier gain and gain stability
7- Class C transistor tuned amplifier
8- Rectifier circuits with capacitance filters,
9- Transistor series regulator discrete system, transistor series regulator using op-amps
- Op-amp characteristics measurements
- Applications of op-amps
12- Oscillator circuits

TE221 Digital Electronics

Year : two
Semesters: 03 and 04
Credit/Lec./Rec./Lab. 4/3/0/3

Outline

I- Binary Arithmetic

II- Boolean Algebra

III- Logic Gates
- 3.1- Combinational logic
- 3.2- Families

IV- Astable, Monostable, Schmitt Trigger

V- Flip-flops
- 5.1- SR
- 5.2- D
- 5.3- JK
- 5.4- master-slave

VI- Counters
- 6.1- Ripple counters
- 6.2- Synchronous counters
- 6.3- IC counters
- 6.4- Up/down counters
- 6.5- Counter design

VII- Shift Registers
- 7.1- Left (L)/right (R) shift register
- 7.2- Serial in parallel out (SIPO)
- 7.3- Parallel in serial out (PISO)
- 7.4- Parallel in parallel out (PIPO)
- 7.5- Universal shift register

VIII- Encoders, Decoders
- 8.1- Binary to decimal conversion
- 8.2- Decimal to binary conversion
- 8.3- Excess-3 code

IX- Multiplexers, Demultiplexers

X- Memory Devices
- 10.1- Volatile memory
- 10.2- Permanent (nonvolatile) memory
- 10.3- Memory system

XI- Optical Electronics
- 11.1- Decoder/driver
- 11.2- Seven-segment display
- 11.3- Dot matrix

XII- Arithmetic Circuits
- 12.1- Half-adder
- 12.2- Full-bit binary adder
- 12.3- Examples adder circuits
- 12.4- Binary multiplication
- 12.5- 74181 Arithmetic logic unit (ALU)

XIII- Semiconductor Technology and Applications

Laboratory

1- Basic logic functions
2- Simplification of combinational logic circuits
3- counters
4- Shift registers
5- Decoders and encoders
6- Multiplexers and demultiplexers
7- Timing circuits
8- ALU
9- Memory organization
10- Displays

TE221 Computer Programming

Year : two
Semesters: 03 and 04
Credit/Lec./Rec./Lab. 3/1.5/0/1.5

Outline

I- Introduction
- 1.1- Computer types
- 1.2- Machine and assembly language
- 1.3- High level language
- 1.4- Single and multi-user (time-sharing) systems

II- Flowchart and Algorithm
- 2.1- Symbols for input/output
- 2.2- Begin/end
- 2.3- Processing
- 2.4- Decision
- 2.5- Flow line and connector
- 2.6- Examples

III- Representation of Constants, Variables and Expressions
- 3.1- Basic/Pascal statements
- 3.2- Display and printer control
- 3.3- Programming examples

IV- Transfer Statements
- 4.1- Unconditional branch statements
- 4.2- IF-THEN-ELSE statements
- 4.3- Other conditional branch statements
- 4.4- Examples

V- Counting Process

VI- Accumulation (Loops) Process

VII- String Variables Manipulation

VIII- Subroutines

IX- Functions

X- Introduction to Databases

Laboratory

Programming in Basic or Pascal using the VAX/VMS computer system.

TE231 Electric Circuits and Machines

Year : two
Semesters: 03 and 04
Credit/Lec./Rec./Lab. 4/3/1.5/1.5

Outline

I- Theorems in AC Circuits

II- Power in AC Circuits

III- Series and Parallel Resonance

IV- Three-Phase Circuits

V- Fourier Series

VI- Mutual Inductance

VII- Z, Y and H Parameters

VIII- Polyphase Systems
- 8.1- Review of basic principles: methods of interconnection, evaluation of voltage and current, power and methods of measurements
- 8.2- Introduction to 6-phase and 12-phase systems

IX- Power Components and Circuits
- 9.1- Performance characteristics
- 9.2- Power transmission line

X- Introduction to Machines

XI- Machine Operation (as a load not a study of construction)
- 11.1- Principles of operation
- 11.2- Circuit diagram representation
- 11.3- DC and AC characteristic curves
- 11.4- DC motors: shunt, series, compound, servo, permanent magnet, split field
- 11.5- AC motors: synchronous, universal, induction
- 11.6- Digital: stepping

XII- Machine Control Principles
- 12.1- Direction of rotation
- 12.2- Speed
- 12.3- DC output voltages and polarity
- 12.4- AC output voltages, frequency and phase
- 12.5- Starting and stopping
- 12.6- Machine control terminology: adjustable drive, asynchronous, braking, inching, jogging, plugging, pull-in torque, reversing, slip, synchronous, torque

XIII- Protection
- 13.1- Common fault conditions
- 13.2- Descriptive treatment of fault determination and elimination of counteraction

XIV- Transducers
- 14.1- Transducers used in the control of electric machines
- 14.2- Application of typical transducers

Laboratory

1- Power in AC circuits
2- Series and parallel resonance
3- 3-phase circuits
4- Transformer ad mutual inductance
5- Polyphase systems: watts, VARs, volt-amperes
6- Transformers:
   - 6.1- Regulation, auto-transformer, parallel connections
   - 6.2- Three-phase transformer, 3-phase to 2-phase conversion

7- Transmission line characteristics

8- Characteristics of machines
   - 8.1- DC motor
   - 8.2- Induction motor
   - 8.3- Capacitor – start motor
   - 8.4- Universal motor
   - 8.5- Synchronous motor

9- Machine control performance
   - 9.1- Frequency conversion
   - 9.2- Speed control

TE291 Management

Year : two
Semesters: 03 and 04
Credit/Lec./Rec./Lab. 2/1.5/0/0

Outline

I- Background of Production Management

II- Basic Economic Concepts

III- Equipment and Working Facilities

IV- Procurement and Storage

V- Production Planning and Control

TE224 Introduction to Computer Technology

Year: three
Semester: 05
Option: Digital

Credit/Lec./Rec./Lab. 3/1.5/1.5/1.5
Reference book: PC Intern, Michael Tischer

Outline

I- Introduction to Computers

II- Personal Computer Organization

III- Central Processing Unit

IV- Memory Organization

V- Machine Language Programming: the Debugger

VI- Assembly Language Programming: MASM or TASM

VII- Programming Examples

VIII- Input-Output Handling

IX- Interrupt Handling

X- High Level Language Programming: C or Pascal Language

Laboratory

1- PC debugger: enter, edit and run a machine language program.
2- MASM or TASM assembly language programming
3- Debugging assembly language programs
4- C or Pascal programming

TE321 Microprocessors

Year: three
Semester: 05
Option: Digital, Maintenance, Power

Credit/Lec./Rec./Lab. 4/3/0/3
Textbook: The Z-80 Microprocesor, Ramesh S. Gaonkar, 3rd Edition.

Outline

I- Introduction to Microprocessors
- 1.1- Microprocessor History and Evolution
- 1.2- Microcomputers and Large Frame Systems
- 1.3- Microprocessor-Based Systems Architecture
- 1.4- Microprocessor Architecture
  - 1.4-1. General computer architecture
  - 1.4-2. The MPU
  - 1.4-3. Input/Output
  - 1.4-4. A Comparison of Typical Microprocessors

II- The Z-80 Microprocessor
- 2.1- MPU Signal Description
- 2.2- Programming Model
- 2.3- Memory and I/O Interfacing

III- Z-80 Assembly Language Programming
- 3.1- Instruction Set and Machine Language Programming
- 3.2- Addressing Modes
- 3.3- Introduction to Z-80 Assembly Language and Programming
- 3.4- Assemblers and Software Development Tools
- 3.5- Stacks and Subroutines
- 3.6- Programming Examples

IV- Memory Interfacing
- 4.1- MPU Timing Diagrams
- 4.2- Timing Considerations of Memory Devices
- 4.3- Memory Organization and Address Decoding
- 4.4- Memory Expansion
- 4.5- MT-80AZ Memory Map

V- I/O Interfacing
- 5.1- Interrupt Handling Techniques
- 5.2- Simple Input/Output Devices
- 5.3- I/O Device selection
- 5.4- Programmable Interface Devices:
  - 5.4-1. Intel PPI 8255
  - 5.4-2. Zilog Parallel Input Output (PIO)
  - 5.4-3. Zilog Counter Timer Circuit (CTC)

VI- Direct Memory Access
- 6.1- DMA Concepts
- 6.2- The Z-80 DMA Structure

VII- Microprocessor-Based Systems
- 7.1- Application Examples

VIII- Trends in Microproecessors 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)

3rd Year Program

Semesters 05 and 06

Digital Option

TE322 Digital Systems Troubleshooting

Year: three
Semester: 05
Option: Digital

Credit/Lec./Rec./Lab. 2/1.5/0/3

Outline

I- Introduction
- 1.1- Component failure
- 1.2- IC testing

II- Digital Measurements
- 2.1- General consideration
- 2.2- Digital signal characteristics
- 2.3- Digital probe application techniques
- 2.4- Digital multimeter

III- The Logic Analyzer
- 3.1- Complete study of the logic analyzer (available type)
- 3.2- Applications

IV- Testing the Microprocessor

V- Trouble shooting System Failure

Laboratory

TE324 Programmable Controllers

Year: three
Semester: 05
Option: Digital

Credit/Lec./Rec./Lab. 3/1.5/1.5/1.5
Textbook: Programmable Logic Controllers.

Outline

I- Introduction to PLCs
- 1.1- Microprocessors evolution
- 1.2- Micro-controllers
- 1.3- Application Specific ICs (ASICs)
- 1.4- Application of PLCs

II- PLC Architecture
- 2.1- Example Architectures
- 2.2- Logic Circuitry
- 2.3- I/O Ports
- 2.4- RAM/EPROM
- 2.5- Power Interface

III- Introduction to Programming
- 3.1- Instruction Set
- 3.2- Ladder Diagram
- 3.3- Programming Examples

IV- Advanced PLC Functions
- 4.1- Ladder Diagram Simplification
- 4.2- Advanced Functions (Timing, Delay)
- 4.3- Power Interfacing

V- Advanced PLC Programming
- 5.1- Problem specification
- 5.2- Problem solving

TE332 Power Electronics

Year: three
Semester: 05
Option: Digital, Maintenance, Power

Credit/Lec./Rec./Lab. 3/1.5/1.5/1.5
Textbook:

Outline

I- 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

II- Power Devices
- 2.1- Power rectifier: thyristor, TRIAC, gate turn-off switch
- 2.2- Power devices characteristics and parameters
- 2.3- Thermal performance under normal and fault conditions, heat sinks
- 2.4- Gating requirements

III- Power Rectification
- 3.1- Single and 3-phase half wave, full wave center-tapped and bridge circuits
- 3.2- Development of circuit operation and complete circuit waveforms with R, RL, back EMF loads
- 3.3- Prediction of differences between ideal and practical circuits
- 3.4- Operation and use of freewheeling diode
- 3.5- Application areas

IV- Controlled Rectification Principles
- 4.1- Combination of silicon controlled rectifiers
- 4.2- Phase control principles and the problems of firing (gating), RF interference, switching transients
- 4.3- Properties and use of snubber circuits
- 4.4- Graphical performance curves

V- AC Voltage Control Principles
- 5.1- Principles of phase control
- 5.2- Comparison of operational characteristics of the systems
- 5.3- Voltage, power and harmonic contents graphical performance curves
- 5.4- Comparison of TRIAC with inverse-parallel SCR arrangement

VI- DC-DC Converters
- 6.1- Commutation in DC systems and circuits used to turn off SCR's
- 6.2- Basic DC chopper circuit

VII- Inverters
- 7.1- Series and parallel single-phase inverters
- 7.2- Filtering techniques used to improve output waveforms

VIII- Frequency Changing: Cycloconverters and Cycloinverters

IX- Power Factor Correction: Basic Networks

X- Power Control Systems
- 10.1- Motor speed control
- 10.2- Lighting systems
- 10.3- Heater controls

XI- Protection Systems
- 11.1- Generation and elimination of transients
- 11.2- Protection of devices

Laboratory

1- Use of oscilloscope to display the major characteristics of SCR and TRIAC
2- Reverse-recovery current demonstration
3- Single-phase rectifier: half-wave with R, RL, back emf and freewheeling diode
4- Single-phase rectifier: switching transients, output parameters measurements, frequency spectrum demonstration
5- Phase shift networks
6- Single-phase AC control
7- DC commutation and chopper circuits
8- Parallel inverter
9- Light control circuits: DC flasher, AC flasher, ring counter, light dimmer
10- Motor speed control

TE318 Digital Communications

Year: three
Semester: 06
Option: Digital

Credit/Lec./Rec./Lab. 4/3/0/3
Textbook:

Outline

I- Introduction to Communication Systems
- 1.1- Communications
- 1.2- Communications systems: information, transmitter, channel noise, receiver
- 1.3- Modulation/demodulation
- 1.4- Bandwidth requirements

II- Noise
- 2.1- External noise
- 2.2- Internal noise

III- Amplitude Modulation (AM)
- 3.1- AM theory
- 3.2- Generation of AM

IV- Frequency Modulation (FM)
- 4.1- Theory of frequency and phase modulation
- 4.2- Generation of FM

V- Transmission Lines

VI- Digital Communication Modes
- 6.1- PCM
- 6.2- FSK
- 6.3- PSK
- 6.4- Other modulation techniques

VII- Code Sets and Characters
- 7.1- ASCII
- 7.2- EBCDIC
- 7.3- CCITT-V24
- 7.4- Baudot

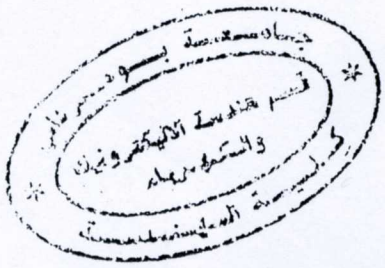
VIII- Error Detection and Correction
- 8.1- Control procedures
- 8.2- Digital vs. Analog
- 8.3- Bit characteristics
- 8.4- Parity generation-checking
- 8.5- The Hamming code

IX- Modems and Interfacing
- 9.1- Types
- 9.2- Baud rates
- 9.3- RS232-C interface, etc…

X- Computer Communications
- 10.1- Parallel vs. serial communication
- 10.2- Terminal to computer interface
- 10.3- Computer to computer interface

XI- Communication Protocols
- 11.1- Message format and transfer
- 11.2- Communication protocols

Laboratory



TE323 Industrial Process Control

Year: three
Semester: 06
Option: Digital, Maintenance

Credit/Lec./Rec./Lab. 4/3/0/3
Textbook: Process Control Instrumentation Technology, Curtis D. Johnson, 3rd edition

Outline

I- Introduction to Process Control
- 1.1- Definition of process control
- 1.2- Elements
- 1.3- Evaluation of process control
- 1.4- Analog vs. digital Configurations
- 1.5- Transient functions
- 1.6- Units, standards and definitions

II- Transducers
- 2.1- Definitions
- 2.2- Signal conditioning
  - 2.2-1. Bridge circuits: null condition, current balance bridge
  - 2.2-2. Potentiometer circuits
  - 2.2-3. Active circuits: op-amps – inverting, non-inverting, summing, V-I and I-V converters, integrator, sample-and-hold
- 2.3- Thermal transducers
- 2.4- Optical transducers
- 2.5- Physical transducers
  - 2.5-1. Displacement
  - 2.5-2. Pressure
  - 2.5-3. Flow, level

III- Final Control Elements
- 3.1- Principles
  - 3.1-1. Signal conversion
  - 3.1-2. Actuator
  - 3.1-3. Final control device
- 3.2- Examples of final controls
  - 3.2-1. Electric actuators
  - 3.2-2. Control valves

IV- Controllers
- 4.1- Definitions
- 4.2- Discontinuous controller modes
  - 4.2-1. Two-position control
  - 4.2-2. Multiple position
  - 4.2-3. Floating

4.3- Continuous controller modes
- 4.3-1. Proportional mode
- 4.3-2. Integral mode
- 4.3-3. Derivative mode

4.4- Composite controller modes

4.5- Analog vs. digital systems

V- Control Loops

5.1- Configurations: single variable, cascade

5.2- Stability and quality: feedback gain and phase, cyclic response

5.3- Loop tuning
- 5.3-1. Transient response
- 5.3-2. Ziegler-Nichols chart
- 5.3-3. Frequency response

VI- Data Acquisition

6.1- Hardware: comparators, DAC, ADC, DAS, microprocessors

6.3- Software: format, input data operation, controller modes, time delays, function generation, microprocessor interrupt handling.

VII- Computers in Process Control

7.1- Programmable controllers

7.2- Digital data acquisition systems (DDAS)

7.3- Supervisory control

7.4- Direct digital control (DDC)

7.5- Characteristics of digital data.

Laboratory

1- Z80 Based Microcomputer, Comparators, DAC, ADC, Computer signal generation, two position control, temperature control.

2- PLC FX0s-based experiments

TE325 Special Topic on Computers

Year: three
Semester: 06
Option: Digital

Credit/Lec./Rec./Lab. 3/1.5/0/1.5
Textbook:

Outline

Topics: choose one of the following

1- Artificial Intelligence
2- Graph Theory
3- Matlab
4- Computer Networks
5- Etc…

TE312 Electronic Communications

Year: three
Semester: 05
Option: Maintenance

Credit/Lec./Rec./Lab. 4/3/0/3
Textbook:

Outline

I- Introduction to Communication Systems

II- RF Amplifiers
- 2.1- Tuned RF amplifiers
- 2.2- Neutralization
- 2.3- Special RF amplifiers
- 2.4- Frequency conversion and mixers
- 2.5- Intermediate frequency (IF) amplifiers
- 2.6- Transmitter and amplifier matching

III- Amplitude Modulation (AM)
- 3.1- Introduction
- 3.2- Mathematical description
- 3.3- Frequency spectrum
- 3.4- Power content
- 3.5- Single side band (SSB) and double side band (DSB) techniques
- 3.6- Generation of AM

IV- Frequency Modulation (FM)
- 4.1- Theory of FM and phase modulation (PM)
- 4.2- Percent modulation
- 4.3- Center frequency and band width (BW) allocation, deviation ratio
- 4.4- Generation of FM

V- Receivers
- 5.1- Demodulation
- 5.2- Detection of AM and FM
- 5.3- Super heterodyne receivers
- 5.4- Automatic gain control (AGC)
- 5.5- Automatic frequency control (AFC)
- 5.6- Amplitude limiters
- 5.7- Radio and TV receivers

VI- Transmitters
- 6.1- Introduction
- 6.2- AM transmitters
- 6.3- FM transmitters
- 6.4- Radio and TV transmitters

VII- Transmission Line
- 7.1- Introduction
- 7.2- Primary line constants
- 7.3- Phase velocity and line wavelength
- 7.4- Characteristic impedance
- 7.5- Reflected wave and standing wave ratio (SWR)
- 7.6- Reflected power
- 7.7- Telephone line and cable

VIII- Radiation and Propagation of Waves
- 8.1- Electromagnetic radiation
- 8.2- Propagation in free space
- 8.3- Tropospheric and ionospheric propagation

IX- Antenna Fundamentals
- 9.1- Isotropic radiation
- 9.2- Polar diagram
- 9.3- Antenna power gain or directivity
- 9.4- Vertical antennas
- 9.5- Folded elements
- 9.6- VHF and UHF antennas

X- Noise
- 10.1- External noise
- 10.2- Internal noise
- 10.3- Noise calculation
- 10.4- Noise figure
- 10.5- Noise temperature

Laboratory

1- Hartley oscillator
2- Audio pre-amplifier, driver and output stage
3- Super heterodyne 1st and 2nd amplifier stage
4- Amplitude modulation and demodulation
5- Super heterodyne detector and AVC stage
6- Super heterodyne converter stage
7- RF amplifier
8- FM, detection principles
9- AFC principles
10- Varactor diode
11- Beat frequency principles

TE321 Microprocessors

Year: three
Semester: 05
Option: Digital, Maintenance, Power

Credit/Lec./Rec./Lab. 4/3/0/3
Textbook: The Z-80 Microprocesor, Ramesh S. Gaonkar, 3rd Edition.

Outline

I- Introduction to Microprocessors
- 1.1- Microprocessor History and Evolution
- 1.2- Microcomputers and Large Frame Systems
- 1.3- Microprocessor-Based Systems Architecture
- 1.4- Microprocessor Architecture
  - 1.4-1. General computer architecture
  - 1.4-2. The MPU
  - 1.4-3. Input/Output
  - 1.4-4. A Comparison of Typical Microprocessors

II- The Z-80 Microprocessor
- 2.1- MPU Signal Description
- 2.2- Programming Model
- 2.3- Memory and I/O Interfacing

III- Z-80 Assembly Language Programming
- 3.1- Instruction Set and Machine Language Programming
- 3.2- Addressing Modes
- 3.3- Introduction to Z-80 Assembly Language and Programming
- 3.4- Assemblers and Software Development Tools
- 3.5- Stacks and Subroutines
- 3.6- Programming Examples

IV- Memory Interfacing
- 4.1- MPU Timing Diagrams
- 4.2- Timing Considerations of Memory Devices
- 4.3- Memory Organization and Address Decoding
- 4.4- Memory Expansion
- 4.5- MT-80AZ Memory Map

V- I/O Interfacing
- 5.1- Interrupt Handling Techniques
- 5.2- Simple Input/Output Devices
- 5.3- I/O Device selection
- 5.4- Programmable Interface Devices:
  - 5.4-1. Intel PPI 8255
  - 5.4-2. Zilog Parallel Input Output (PIO)
  - 5.4-3. Zilog Counter Timer Circuit (CTC)

VI- Direct Memory Access
- 6.1- DMA Concepts
- 6.2- The Z-80 DMA Structure

VII- Microprocessor-Based Systems
- 7.1- Application Examples

VIII- 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 (DAC's Interfacing)
7- Data Acquisition (ADC Interfacing)

TE332 Power Electronics

Year: three
Semester: 05
Option: Digital, Maintenance, Power

Credit/Lec./Rec./Lab. 3/1.5/1.5/1.5
Textbook:

Outline

I- 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

II- Power Devices
- 2.1- Power rectifier: thyristor, TRIAC, gate turn-off switch
- 2.2- Power devices characteristics and parameters
- 2.3- Thermal performance under normal and fault conditions, heat sinks
- 2.4- Gating requirements

III- Power Rectification
- 3.1- Single and 3-phase half wave, full wave center-tapped and bridge circuits
- 3.2- Development of circuit operation and complete circuit waveforms with R, RL, back EMF loads
- 3.3- Prediction of differences between ideal and practical circuits
- 3.4- Operation and use of freewheeling diode
- 3.5- Application areas

IV- Controlled Rectification Principles
- 4.1- Combination of silicon controlled rectifiers
- 4.2- Phase control principles and the problems of firing (gating), RF interference, switching transients
- 4.3- Properties and use of snubber circuits
- 4.4- Graphical performance curves

V- AC Voltage Control Principles
- 5.1- Principles of phase control
- 5.2- Comparison of operational characteristics of the systems
- 5.3- Voltage, power and harmonic contents graphical performance curves
- 5.4- Comparison of TRIAC with inverse-parallel SCR arrangement

VI- DC-DC Converters
- 6.1- Commutation in DC systems and circuits used to turn off SCR's
- 6.2- Basic DC chopper circuit

VII- Inverters
- 7.1- Series and parallel single-phase inverters
- 7.2- Filtering techniques used to improve output waveforms

VIII- Frequency Changing: Cycloconverters and Cycloinverters

IX- Power Factor Correction: Basic Networks

X- Power Control Systems
- 10.1- Motor speed control
- 10.2- Lighting systems
- 10.3- Heater controls

XI- Protection Systems
- 11.1- Generation and elimination of transients
- 11.2- Protection of devices

Laboratory

1- Use of oscilloscope to display the major characteristics of SCR and TRIAC
2- Reverse-recovery current demonstration
3- Single-phase rectifier: half-wave with R, RL, back emf and freewheeling diode
4- Single-phase rectifier: switching transients, output parameters measurements, frequency spectrum demonstration
5- Phase shift networks
6- Single-phase AC control
7- DC commutation and chopper circuits
8- Parallel inverter
9- Light control circuits: DC flasher, AC flasher, ring counter, light dimmer
10- Motor speed control

TE345 Electronic Troubleshooting and Methodology

Year: three
Semester: 05
Option: Maintenance

Credit/Lec./Rec./Lab. 4/3/0/3
Textbook:

Outline

I- Introduction to Troubleshooting
- 1.1- Overall troubleshooting procedure
- 1.2- Relationship among troubleshooting steps
- 1.3- Modification of the troubleshooting procedure

II- Electrical Safety
- 2.1 General electric safety
- 2.2 Technician safety
- 2.3 Measurement of current leakage
- 2.4 The three-wire grounded outlet
- 2.5 Further wiring safety considerations
- 2.6 Equipment for safety measurements

III- Determining Trouble Symptoms
- 3.1- Knowing the equipment
- 3.2- Use of operations controls during troubleshooting
- 3.3- Recognizing trouble symptoms
- 3.4- Equipment failure versus degraded performance
- 3.5- Evaluation of symptoms

IV- Localizing Trouble to a Functional Unit
- 4.1- Meaning of "localize" in troubleshooting
- 4.2- Functional divisions of equipment
- 4.3- Functional block diagrams
- 4.4- Bracketing technique
- 4.5- Modifying the trouble-localization sequence
- 4.6- Verifying trouble symptoms

V- Isolating Trouble to a Circuit
- 5.1- Servicing block diagrams
- 5.2- Signal paths
- 5.3- Signal tracing versus signal substitution
- 5.4- Half split technique
- 5.5- Isolating trouble to a circuit within a circuit group

VI- Localizing a Specific Trouble
- 6.1- Locating trouble in plug-in modules
- 6.2- Inspection using the senses
- 6.3- Testing to locate a faulty component
- 6.4- Waveform measurements

- 6.5- Voltage measurements
- 6.6- Resistance measurements
- 6.7- Using schematic diagrams
- 6.8- Internal adjustment during trouble localization
- 6.9- Trouble resulting from more than one fault
- 6.10- Repairing troubles
- 6.11- Operational check-out

VII- Solid-state Servicing Techniques
- 7.1- Measuring voltages in circuits
- 7.2- Troubleshooting with transistor voltages
- 7.3- Testing transistors in circuits (forward-bias method)
- 7.4- Using transistor testers
- 7.5- Testing transistors out of circuits
- 7.6- Testing diodes out of circuits
- 7.7- Effects of capacitors in troubleshooting
- 7.8- Effects on voltage of poor solder joints

VIII- Amplifier Troubleshooting
- 8.1- Basic amplifier troubleshooting
- 8.2- Checking distortion by sine-wave display
- 8.3- Background noise measurement
- 8.4- Feedback amplifier troubleshooting procedures
- 8.5- Effects of transistor leakage current on amplifier gain
- 8.6- Example of audio amplifier troubleshooting

Laboratory

1- Demonstration of troubleshooting equipment and use
2- Using troubleshooting equipment for measuring important quantities, and observing signal waveforms.
3- Using troubleshooting trainer equipment with troubles set up by the instructor, the student should determine the trouble in a systematic way.
   - 3.1- Determine the trouble symptoms
   - 3.2- Localize the trouble to a functional unit
   - 3.3- Isolate the trouble to a circuit
   - 3.4- Locate and repair the trouble
   - 3.5- Make a final operational checkout to ensure all the symptoms are repaired.
4- Testing transistors and diodes in and out of circuit
5- Use a faulty audio amplifier, follow the step-by-step procedure, see 3 above, to determine, localize and repair the failures one at a time.

TE351 Instrumentation and Measurement

Year: three
Semester: 05
Option: Maintenance

Credit/Lec./Rec./Lab. 4/3/0/1.5
Textbook:

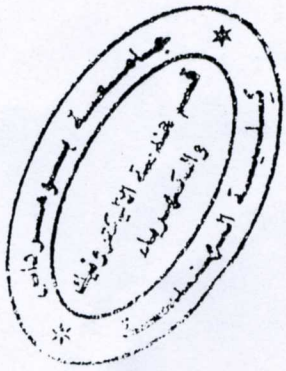
Outline

I- Measurement and Error
- 1.1- Systems of units of measurement
- 1.2- Definitions
- 1.3- Accuracy and precision
- 1.4- Significant figures
- 1.5- Types of errors
- 1.6- Statistical analysis
- 1.7- Probability of errors
- 1.8- Limiting errors

II- Principles and Operation of Potentiometers
- 2.1- Introduction
- 2.2- Potentiometer circuits
- 2.3- Volt box
- 2.4- Shunt box
- 2.5- Null detectors
- 2.6- Calibrations of voltmeters and ammeters
- 2.7- Self balancing potentiometers

III- DC Bridges and their Application
- 3.1- Wheatstone bridge
- 3.2- Kelvin bridge
- 3.3- Loop tests
- 3.4- Guarded Wheatstone bridge

IV- AC Bridges and their Application
- 4.1- General form of the AC bridge
- 4.2- Comparison of bridges
- 4.3- Maxwell bridge
- 4.4- Hay bridge
- 4.5- Schering bridge
- 4.6- Unbalance conditions
- 4.7- Wien bridge
- 4.8- Wagner ground connection
- 4.9- Universal impedance bridge



V- Oscilloscopes
- 5.1- Basic cathode-ray tube (CRT) principles
- 5.2- Horizontal time base
- 5.3- Horizontal deflection by sine wave voltage
- 5.4- The sweep generating circuit
- 5.5- General purpose oscilloscope
- 5.6- Lissajous figures
- 5.7- Special purpose oscilloscopes

VI- Signal Generators
- 6.1- Types of generated signals
- 6.2- Audio frequency oscillator
- 6.3- Radio frequency oscillator
- 6.4- Function generators
- 6.5- Wave form analysis

VII- Integrated Circuits
- 7.1- Introduction to ICs used in instrumentation
- 7.2- Circuit function
- 7.3- Examples of digital, linear and op-amp integrated circuits
- 7.4- Types of linear integrated circuits
- 7.5- Examples of typical IC application

VIII- Analog and digital data Acquisition Systems
- 8.1- Instrumental systems
- 8.2- Digital to analog conversion
- 8.3- Analog to digital conversion
- 8.4- Magnetic tape recorders

IX- Digital Voltmeter, Ammeter and Ohmmeter
- 9.1- Introduction
- 9.2- Digital multimeter
- 9.3- Considerations in choosing a digital multimeter

X- Electronic counters and their Application
- 10.1- Elements of the electronic counter
- 10.2- Decade counting systems
- 10.3- Time base and associated circuitry
- 10.4- Logic circuits
- 10.5- Universal counter

Laboratory

TE323 Industrial Process Control

Year: three
Semester: 06
Option: Digital, Maintenance

Credit/Lec./Rec./Lab. 4/3/0/3
Textbook: Process Control Instrumentation Technology, Curtis D. Johnson, 3rd edition

Outline

I- Introduction to Process Control
- 1.1- Definition of process control
- 1.2- Elements
- 1.3- Evaluation of process control
- 1.4- Analog vs. digital Configurations
- 1.5- Transient functions
- 1.6- Units, standards and definitions

II- Transducers
- 2.1- Definitions
- 2.2- Signal conditioning
  - 2.2-1. Bridge circuits: null condition, current balance bridge
  - 2.2-2. Potentiometer circuits
  - 2.2-3. Active circuits: op-amps – inverting, non-inverting, summing, V-I and I-V converters, integrator, sample-and-hold
- 2.3- Thermal transducers
- 2.4- Optical transducers
- 2.5- Physical transducers
  - 2.5-1. Displacement
  - 2.5-2. Pressure
  - 2.5-3. Flow, level

III- Final Control Elements
- 3.1- Principles
  - 3.1-1 Signal conversion
  - 3.1-2 Actuator
  - 3.1-3 Final control device
- 3.2- Examples of final controls
  - 3.2-1. Electric actuators
  - 3.2-2. Control valves

IV- Controllers
- 4.1- Definitions
- 4.2- Discontinuous controller modes
  - 4.2-1. Two-position control
  - 4.2-2. Multiple position
  - 4.2-3. Floating

4.3- Continuous controller modes
- 4.3-1. Proportional mode
- 4.3-2. Integral mode
- 4.3-3. Derivative mode

4.4- Composite controller modes
4.5- Analog vs. digital systems

V- Control Loops
- 5.1- Configurations: single variable, cascade
- 5.2- Stability and quality: feedback gain and phase, cyclic response
- 5.3- Loop tuning
  - 5.3-1. Transient response
  - 5.3-2. Ziegler-Nichols chart
  - 5.3-3. Frequency response

VI- Data Acquisition
- 6.1- Hardware: comparators, DAC, ADC, DAS, microprocessors
- 6.2- Software: format, input data operation, controller modes, time delays, function generation, microprocessor interrupt handling.

VII- Computers in Process Control
- 7.1- Programmable controllers
- 7.2- Digital data acquisition systems (DDAS)
- 7.3- Supervisory control
- 7.4- Direct digital control (DDC)
- 7.5- Characteristics of digital data.

Laboratory

1- Z80–Based Microcomputer, Comparators, DAC, ADC, Computer signal generation, two–position control, temperature control.
2- PLC FX0s-based experiments

TE352 Electronic Equipment Troubleshooting

Year: three
Semester: 06
Option: Maintenance

Credit/Lec./Rec./Lab. 2/3/0/0
Textbook:

Outline

I- Power Supply
II- Analog Multimeter
III- Digital Multimeter
IV- Function Generator
V- RF Generator
VI- Frequency Counter
VII- Oscilloscope
VIII- Radio Receiver Troubleshooting
IX- Introduction to television
X- Black and White Troubleshooting and Repair
XI- Color TV Fundamentals
XII- Color TV Troubleshooting

Laboratory

1- Power supply: adjustment and calibration, troubleshooting
2- Analog multimeter: adjustment and calibration, troubleshooting
3- Digital multimeter: adjustment and calibration, troubleshooting
4- Function generator: adjustment and calibration, locating troubles
5- RF generator: identification of sections, adjustment and calibration, troubleshooting
6- Frequency counter: identification of sections, adjustment and calibration, troubleshooting
7- Oscilloscope: adjustment and calibration, troubleshooting and test equipment
8- The super heterodyne receiver: identification of sections: AM, FM, Audio amplifier, power supply, waveforms and voltage monitoring.
9- Signal injection and tracing tests, alignment procedures
10- TV troubleshooting techniques and test instruments: DC voltage measurements, oscilloscope measurement, black and white and color bar generator
11- Faults in video amplifiers
12- Checking high voltage power supplies

3rd Year Program

Semesters 05 and 06

Power Option

TE321 Microprocessors

Year: three
Semester: 05
Option: Digital, Maintenance, Power

Credit/Lec./Rec./Lab. 4/3/0/3
Textbook: The Z-80 Microprocesor, Ramesh S. Gaonkar, 3rd Edition.

Outline

I- Introduction to Microprocessors
- 1.1- Microprocessor History and Evolution
- 1.2- Microcomputers and Large Frame Systems
- 1.3- Microprocessor-Based Systems Architecture
- 1.4- Microprocessor Architecture
  - 1.4-1. General computer architecture
  - 1.4-2. The MPU
  - 1.4-3. Input/Output
  - 1.4-4. A Comparison of Typical Microprocessors

II- The Z-80 Microprocessor
- 2.1- MPU Signal Description
- 2.2- Programming Model
- 2.3- Memory and I/O Interfacing

III- Z-80 Assembly Language Programming
- 3.1- Instruction Set and Machine Language Programming
- 3.3- Addressing Modes
- 3.4- Introduction to Z-80 Assembly Language and Programming
- 3.5- Assemblers and Software Development Tools
- 3.6- Stacks and Subroutines
- 3.7- Programming Examples

IV- Memory Interfacing
- 4.1- MPU Timing Diagrams
- 4.2- Timing Considerations of Memory Devices
- 4.3- Memory Organization and Address Decoding
- 4.4- Memory Expansion
- 4.5- MT-80AZ Memory Map

V- I/O Interfacing
- 5.1- Interrupt Handling Techniques
- 5.2- Simple Input/Output Devices
- 5.3- I/O Device selection
- 5.4- Programmable Interface Devices:
  - 5.4-1. Intel PPI 8255
  - 5.4-2. Zilog Parallel Input Output (PIO)
  - 5.4-3. Zilog Counter Timer Circuit (CTC)

VI- Direct Memory Access
- 6.1- DMA Concepts
- 6.2- The Z-80 DMA Structure

VII- Microprocessor-Based Systems
- 7.1- Application Examples

VIII- 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)

TE331 Power System Components

Year: three
Semester: 05
Option: Power

Credit/Lec./Rec./Lab. 4/3/0/1.5
Textbook:

Outline

I- Polyphase Circuits
- 1.1- Three-phase voltages
- 1.2- Three and four-wire wye (Y) systems
- 1.3- Three-wire delta systems
- 1.4- Delta-Wye (Δ-Y) conversion power
- 1.5- Balanced and unbalanced system calculations
- 1.6- Power measurements

II- Transformers
- 2.1- Review of magnetic circuits
- 2.2- Construction of transformers
- 2.3- The ideal transformer
- 2.4- Equivalent circuits
- 2.5- Voltage regulation
- 2.6- Open circuits and short circuit tests
- 2.7- Efficiency calculations

III- Transformer Types
- 3.1- Multiple windings
- 3.2- Auto-transformer
- 3.3- Instrument transformers: current, potential

IV- Transformer Connections
- 4.1- Series
- 4.2- Parallel
- 4.3- Three-phase: Y-Y, Y-Δ, Δ-Δ
- 4.4- Scott connection
- 4.5- V-connection
- 4.6- Polyphase connections for 6, 9 and 12 phases
- 4.7- Vector group of three-phase transformers

V- Circuit Breakers
- 5.1- Construction and operation of
  - 5.1-1. Oil circuit breakers
  - 5.1-2. Air break
  - 5.1-3. Air blast
  - 5.1-4. Semiconductor circuit breakers
- 5.2- Specifications, testing, maintenance and safety of circuit breakers

VI- Electromechanical Devices
- 6.1- Relays
- 6.2- Contactors
- 6.3- Timers

Laboratory

1- Measurement of the power factor (PF) of an inductive load. Use of a capacitor to correct the PF of a large inductive load.
2- Power consumption in Y and Δ connected balanced loads, measure line and phase currents
3- Measure power in a 4-wire balanced and unbalanced Y load, measure line, phase and neutral currents
4- Power measurement by three and two-wattmeter method
5- Single-phase transformer parameters, open circuit and short circuit tests
6- Transformer efficiency
7- Polarity test of a transformer
8- Parallel operation of single phase transformers
9- Characteristics of an auto-transformer
10- Getting two-phase supply from a balanced three-phase Scott-connection supply
11- Three-phase transformer connection
12- Load test on transformer to determine voltage regulation.

TE332 Power Electronics

Year: three
Semester: 05
Option: Digital, Maintenance, Power

Credit/Lec./Rec./Lab. 3/1.5/1.5/1.5
Textbook:

Outline

I- 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

II- Power Devices
- 2.1- Power rectifier: thyristor, TRIAC, gate turn-off switch
- 2.2- Power devices characteristics and parameters
- 2.3- Thermal performance under normal and fault conditions, heat sinks
- 2.4- Gating requirements

III- Power Rectification
- 3.1- Single and 3-phase half wave, full wave center-tapped and bridge circuits
- 3.2- Development of circuit operation and complete circuit waveforms with R, RL, back EMF loads
- 3.3- Prediction of differences between ideal and practical circuits
- 3.4- Operation and use of freewheeling diode
- 3.5- Application areas

IV- Controlled Rectification Principles
- 4.1- Combination of silicon controlled rectifiers
- 4.2- Phase control principles and the problems of firing (gating), RF interference, switching transients
- 4.3- Properties and use of snubber circuits
- 4.4- Graphical performance curves

V- AC Voltage Control.Principles
- 5.1- Principles of phase control
- 5.2- Comparison of operational characteristics of the systems
- 5.3- Voltage, power and harmonic contents graphical performance curves
- 5.4- Comparison of TRIAC with inverse-parallel SCR arrangement

VI- DC-DC Converters
- 6.1- Commutation in DC systems and circuits used to turn off SCR's
- 6.2- Basic DC chopper circuit

VII- Inverters
- 7.1- Series and parallel single-phase inverters
- 10.4- Filtering techniques used to improve output waveforms

VIII- Frequency Changing: Cycloconverters and Cycloinverters

IX- Power Factor Correction: Basic Networks

X- Power Control Systems
- 10.1- Motor speed control
- 10.2- Lighting systems
- 10.3- Heater controls

XI- Protection Systems
- 11.1- Generation and elimination of transients
- 11.2- Protection of devices

Laboratory

1- Use of oscilloscope to display the major characteristics of SCR and TRIAC
2- Reverse-recovery current demonstration
3- Single-phase rectifier: half-wave with R, RL, back EMF and freewheeling diode
4- Single-phase rectifier: switching transients, output parameters measurements, frequency spectrum demonstration
5- Phase shift networks
6- Single-phase AC control
7- DC commutation and chopper circuits
8- Parallel inverter
9- Light control circuits: DC flasher, AC flasher, ring counter, light dimmer
10- Motor speed control

TE333 Electric Machines

Year: three
Semester: 05
Option: Power

Credit/Lec./Rec./Lab. 4/3/0/3
Textbook:

Outline

I- Paralleling of DC Generators
- 1.1- Requirements
- 1.2- Parallel shunt and compound generators: identical and different units
- 1.3- Equalizer connections

II- Paralleling of Synchronous Generators
- 2.1- Requirements
- 2.2- Synchronizing power and torque
- 2.3- Synchronizing procedure
- 2.4- Lamp and synchroscope methods

III- Synchronous Motor
- 3.1- Power factor control
- 3.2- Operation as synchronous capacitor
- 3.3- Vector diagrams
- 3.4- Economical limit of PF improvement
- 3.5- Starting methods

IV- Single Phase Induction Motors
- 4.1- Starting
- 4.2- Operation with double revolving field theory
- 4.3- Split phase
- 4.4- Capacitor start
- 4.5- Capacitor run
- 4.6- Auto-transformer and capacitor type motors with operation and characteristics
- 4.7- Motor efficiency
- 4.8- Tests
- 4.9- Reversing

V- Shaded Pole, Universal Motors
- 5.1- Construction
- 5.2- Operation
- 5.3- Reversing and efficiency
- 5.4- Other single phase motors

VI- AC Motor Control and Operation
- 6.1- General load characteristic consideration
- 6.2- Starting
- 6.3- Reversing
- 6.4- Plugging and speed control with various methods

VII- Motor selection
- 7.1- Investigation on factors of selection

VIII- Special Use of Synchronous and Induction Machines
- 8.1- Frequency converter
- 8.2- Phase converter
- 8.3- Induction regulators

IX- Special DC Machines
- 9.1- Amplydyne
- 9.2- Rosenberg generator
- 9.3- Rototrol
- 9.4- Regulex

TE336 Electric Layout and Design

Year: three
Semester: 05
Option: Power

Credit/Lec./Rec./Lab. 4/3/0/3
Textbook:

Outline

I- Design Considerations
- 1.1- Electrical construction drawing
- 1.2- Electrical diagrams
- 1.3- Block diagrams
- 1.4- One-line diagram

II- Lighting
- 2.1- Definition
- 2.2- Spectrum
- 2.3- Characteristics
- 2.4- Sources
- 2.5- Brightness
- 2.6- Glare
- 2.7- Lamps: types, operation and circuit

III- Non-Lighting Electrical Loads
- 3.1- Home appliances
- 3.2- Heaters, radiators, refrigerators
- 3.3- Other specific loads

IV- Standby Power Systems

V- Conductors
- 5.1- Types: copper, aluminum
- 5.2- Solid conductors
- 5.3- Stranded conductors
- 5.4- Rubber and PVC installation

VI- Electrical Design Drawing

Laboratory

1- Load-dependent circuit design
2- Circuit breakers
3- Size of cables
4- Lighting
5- Power factor improvement

TE334 Power Generation, Transmission and Distribution

Year: three
Semester: 06
Option: Power

Credit/Lec./Rec./Lab. 4/3/0/3
Textbook: Stevenson, Elements of Power System Analysis

Outline

I- Energy Forms and Sources and Parameters Related in the Conversion

II- Power Source Conversion
- 2.1- Hydroelectric
- 2.2- Wind
- 2.3- Geothermal
- 2.4- Solar
- 2.5- Ocean power

III- Energy Source conversion
- 3.1- Nuclear
- 3.2- Fossil fuel energy

IV- Direct Generation
- 4.1- MHD
- 4.2- Fuel cell
- 4.3- Thermoelectric
- 4.4- Thermionic

V- Steam Generation Systems
- 5.1- Steam properties
- 5.2- Steam turbine
- 5.3- Heat generators
- 5.4- Condenser
- 5.5- Gasoline engine
  - 5.5-1. Thermodynamic cycles
  - 5.5-2. Carnot cycles

VI- Energy Conversion and Management

VII- Basic Concepts of Power Transmission

VIII- Series Impedance of Transmission Lines

IX- Capacitance of Lines

X- Current and Voltage Relation on a Transmission Line

XI- Representation of Power systems

XII- Economic Operation and Load Flow

XIII- Symmetrical Components

XIV- Unsymmetrical Components

XV- Short-circuit Calculations and Protection

XVI- Power System Stability

Laboratory

1- Safety and the power supply
2- Phase sequence
3- Real power and reactive power
4- Power flow and reactive power
5- Phase angle and voltage drop between source and destination
6- Parameters affecting real and reactive power flow
7- Parallel lines, transformers and power handling capacity
8- Synchronous motor
9- Synchronous condenser and long high voltage lines
10- Transmission line networks and the Buck-Boost phase shifter.

Note: Field trips to power stations (eg. Cap-Djenet) and substations (eg. Boudouaou) are recommended.

TE335 Troubleshooting and Methodology

Year: three
Semester: 06
Option: Power

Credit/Lec./Rec./Lab. 2/1.5/0/1.5
Textbook:

Outline

To be achieved by February 2002.

Ministry of Higher Education and Scientific Research

University "M'Hamed Bouguerra"
of Boumerdes

Faculty of Engineering

Department of Electrical and Electronic Engineering
(DGEE)

ENGLISH Program Guide

ENGLISH LANGUAGE DEPARTMENT GUIDE TO THE CURRICULUM

1 INTRODUCTION

The English language curriculum is constructed in terms of semester. The following curriculum guide should prove useful in three ways :

a) It can aid teachers in planning the syllabi for each course and in choosing the books for each course. By aiding in syllabus development, it provides a broadly standardized outline of what the department will teach each semester. It thus provides a basis of interaction between teachers of the same semester and across semesters. An overview of the programme is then established.

b) It provides general parameters for the documentation of each course and to give some labels to parts of English lessons that will help standardize documentation.

c) It provides categories for English lessons that will facilitate a well-organized Materials Bank.

The lists are ideal language proficiency objectives that relate to student activities carried on in English in the INELEC environment. One textbook will not necessarily fulfill all the objectives as they are stated. There are objectives that no textbook accomplishes; rather mixing and matching or creating materials will be appropriate. However, the objectives present the basic idea, and the suggested textbooks will be applicable to the goal. Audio-tapes, video-tapes and films are used in the Language Laboratory (tape recorders) and Media Rooms to fulfill many of the listening (and speaking objectives). Some teacher creativity will be particularly necessary. It is hoped that each semester will provide instructor-created materials that are appropriate to the objectives; however, there is no expectation that one teacher or that one semester will fill all the gaps.

2. SEMESTER ONE (TO1: TS 111 and EO1: ES 111)

English I: 24 contact hours divided as follows:

I) Reading and writing: 6 hours
II) Grammar Structure: 6 hours
III) Listening and Speaking: 6 hours
IV) Electricity Module (English for Electricity): 6 hours

2.1 Reading and writing

The following list is a sequence of objectives to be accomplished by the student while focusing on reading and writing as language skills. This first semester should provide a strong working base.

Recognize and write the alphabet

Know dictionary skills : alphebetization
type face, abbreviations
correct definition
use of examples
parts of speech
verb and noun forms

Practice punctuation fundamentals (continue throughout course)

Practice comprehension by reading aloud (sound-spelling recognition) and answering questions

Follow instructions

Learn & practice reference skills

Identify paragraph organization : topic
main ideas
supporting details

Recognize the elements of discourse : chronological order
comparison/contrast
appearance (description)
functional operation
explanation
definition

Be able to identify parts and/or objects from a description

Read and set up graphs

Scan

Preview a text

• EST Topic Objectives

The following list is a chronological sequence of EST topics to be introduced to the first semester students. The list is long, but almost all concepts can be introduced first semester at a sentence and short paragraph level. The second semester will be used to deepen and lengthen the materials used. Terminology abounds in this area, so several variations for most concepts have been listed.

1. properties
   shapes
   measurement
   proportion/comparison and contrast
   frequency

2. location/position /direction
   structure /composition / partition

3. function and ability
   movement and action/ agent

4. sequence/chronological order
   process/ relationships other than chronological
   cause and effect / result classes
   method / following directions / instructions
   experiments / lab reports
   reporting observations / results / conclusions

5. generalizations / induction-deduction
   probability
   hypothesis

6. definition
   classification / division

7. graphs and diagrams

8. word problems

9. explanations
   descriptions

The main objective of this list is to get the students acquainted with the **special/technical language** components they will need when communicating in their technical courses. Their introduction is not exclusively limited to the Reading and Writing course; they are rather treated on an integrative basis.

2.2 Listening and Speaking

The following list is a sequence of objectives to be accomplished by the student while focusing on listening and speaking as language skills. These skills are important since classroom learning is based on these abilities.

Pronounce letters and sounds (keyed to spelling)

Repeat words / sentences / phrases

Read aloud compreshensibly (sound-spelling coordination)

Ask for word meaning

Ask for information when something is not understood

Understand question forms : yes/no, wh-, affirmative-negative

Give information about a person : biographical details, activities

Practice intonation and pronunciation of questions, commands, and sentences

Produce inflectional endings (plurals, verb tense, etc.)

Recognize new words occurring within a mini-lecture by context and knowledge of roots and affixes

Recognize or supply correct vocabulary or grammatical form necessary in a focused listening text

Understand the description and function of an object

Discuss instruments or tools : parts, size, types, colors, materials and purposes

Express simple desires

Make requests and commands (recognize difference)

Comprehend intonation and stress pattern that would occur withing a lecture

Be able to produce and understand the purpose of an instruction or command

Identify significant facts, main ideas and supporting evidence from a simple lecture with visual cues

Tell a simple narrative in the past

Relate future plans

Hear and define key subtechnical vocabulary within a listening text

Answer a problem with visuals as aids

Explain moving parts or changes

Ask specific questions about specific details : wh-, yes/no, either-or

Understand technical definitions given within a lecture

2.3 Grammar

Grammar Structures Objectives

The following alphabetical list of structures is a guideline for documenting and teaching the grammar to be included in this semester. The sequence of presentation depends on each separate course organization. If this list is completed before the semester ends, innovation, review, and/or advanced grammar work is suggested.

Adjectives
Adjective phrases

Adverbial expression (with + NP, by + N, by + V + ing)
Adverbs of frequency
Adverbs of place and location/time/manner

Articles

Be

Comparisons

Compound nouns

Conditionals

Conjunctions

Demonstratives

Direct/indirect objects

Expletives (it, there in subject positions)

Gerunds

Indefinite pronouns (one, ones, other, etc.)

Intensifiers (very, too, enough, etc.)

Logical linkers

Mass and unit (how much/how many - count/non-count nouns)

Modals

Negatives

Noun plurals

Participles (as adjectives)

Passive voice

Prepositions of place/position, time, manner
Prepositional phrases

Pronouns

Punctuation

Qualifiers

Questions (wh-, other, short/long response)

Superlatives

Requests and Commands

Relative clauses (adjective-definition)

Verb tenses (simple present, present continuous, simple past, future, present perfect, past perfect)
Verbs : two-word separable/unseparable
Verbs : Special (say-tell, make-do, talk-speak, lay-lie, rise-raise, sit-set)

2.1 Electricity Module (English for Electricity)

Course : 4 hours
Lab : 2 hours

Although the module is constructed on a subject syllabus, it treats the language on a topical-structural basis. In addition to the technical and structural components, functional notions are introduced gradually to prepare students write definitions, descriptions, comparisons ...

a) Course Content

Introduction to Electricity
-The Importance of Electricity
- Early History
-What is Electricity.

Structure of Matter
-What is Matter?
-The Elements
-The compound
-The molecule
-The Atom

Atomic Theory
-The structure of the Atom
-The nucleus
-The proton
-The electron

Electrical Charges
-The law of electrical charges
-Atomic charges
-Charged materials
-Charging by contact and by induction
-Attraction and repulsion
-Electrostatic fields