**YMCA University of Science & Technology, Faridabad**
**New Scheme of Studies & Examination**
**B.Tech II$^{nd}$ Year (Electronics Instrumentation & Control Engineering)**
**Semester – III**

| Course No. | Course Title | Teaching Schedule | | | | Marks of Class Work | Examination | | Total Marks | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | | Theory | Practical | | |
| HAS-201 | Mathematics – III | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| E-203 | Electrical Engineering Materials & Semiconductor Devices | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| E-205 | Network Analysis And Synthesis | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-207 | Electromechanical Energy Conversion | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| E-209 | Electrical Measurement and Measuring Instruments | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| E-211 | Analog Electronics | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| E-213 | Network Analysis And Synthesis Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| E-217 | Electrical Measurement and Measuring Instruments Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| E-215 | Electrical Machine-1 Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| E-219 | Analog Electronics Lab | | | 2 | 2 | 30 | - | 20 | 50 | 01 |
| EIC-221 | Workshop –III | - | - | 8 | 8 | 120 | - | 80 | 200 | 04 |
| | **TOTAL** | **24** | **-** | **16** | **40** | **480** | **360** | **160** | **1000** | **32** |

**YMCA University of Science & Technology, Faridabad**
**New Scheme of Studies & Examination**
**B.Tech II$^{nd}$ Year (Electronics Instrumentation & Control Engineering)**
**Semester – IV**

| Course No. | Course Title | Teaching Schedule | | | | Marks of Class Work | Examination | | Total Marks | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | | Theory | Practical | | |
| MGMT-201 | Economics for Engineers | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| E-204 | Electronics Instrumentation | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| E-206 | Computational Techniques | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| E-208 | Digital Electronics | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-210 | Control Systems-I | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| E-212 | Electro Magnetic Field Theory | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| E-216 | Digital Electronics Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| E 214 | Computational Technique Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| EIC-218 | Control Systems Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| EIC-220 | Workshop-IV | - | - | 8 | 8 | 150 | - | 100 | 200 | 04 |
| | **TOTAL** | **24** | **-** | **14** | **38** | **480** | **360** | **160** | **1000** | **32** |

**YMCA University of Science & Technology, Faridabad**
**New Scheme of Studies & Examination**
**B.Tech III[rd] Year (Electronics Instrumentation & Control Engineering)**
**Semester – V**

| Course No. | Course Title | Teaching Schedule | | | | Marks of Class Work | Examination | | Total Marks | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | | Theory | Practical | | |
| EIC-301 | Transducer & Signal Conditioning | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-303 | Non Linear Control Systems | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| E-305 | Analog Integrated Circuits | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| CE-203 | Data Structures | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| E-309 | Power Electronics | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| E-311 | Microprocessors And Interfacing | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EL-315 | Power Electronics Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| E-317 | Microprocessors and Interfacing Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| E-319 | Analog Integrated Circuits Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| EIC-321 | Workshop-V | - | - | 8 | 8 | 150 | - | 100 | 250 | 05 |
| | **TOTAL** | **24** | **-** | **16** | **40** | **480** | **360** | **160** | **1000** | **32** |

**YMCA University of Science & Technology, Faridabad**
**New Scheme of Studies & Examination**
**B.Tech III$^{rd}$ Year (Electronics Instrumentation & Control Engineering)**
**Semester – VI**

| Course No. | Course Title | Teaching Schedule | | | | Marks of Class Work | Examination | | Total Marks | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | | Theory | Practical | | |
| E-302 | Digital System Design | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-304 | Telemetry, Data Processing and Recording | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-306 | Computer Networks | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-308 | Computer Based Instrumentation and Control | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-310 | Industrial process Control | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-312 | Biomedical Instrumentation | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-314 | Electronic Circuit Simulation Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| EIC-316 | Network Programming Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| E-318 | Digital System Design Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| EIC-320 | Instrumentation Project Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| EIC-322 | Workshop-VI | - | - | 8 | 8 | 120 | - | 80 | 200 | 04 |
| | **TOTAL** | **24** | **-** | **16** | **40** | **480** | **360** | **160** | **1000** | **32** |

**YMCA University of Science & Technology, Faridabad**
**New Scheme of Studies & Examination**
**B.Tech IV$^{th}$ Year (Electronics Instrumentation & Control Engineering)**
**Semester – VII**

| Course No. | Course Title | Teaching Schedule | | | | Examination | | Total Marks | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | INT. | EXT. | | |
| E-401 | INDUSTRIAL TRAINING | 8 HR/DAY | | | | 300 | 200 | 500 | 10 |

**A) PROCEDURE FOR ANNUAL EXAMINATION AND MARKS.**

| | | |
|---|---|---|
| 1. PROJECT EVALUATION | 50 MARKS | |
| 2. PROJECT SEMINAR | 50 MARKS | |
| 3. PROJECT VIVA | 100 MARKS | **200** |

**B) CONTINUOUS ASSESSMENT MARKS**

| | | |
|---|---|---|
| 1. ASSESSMENT BY INSTITUTE FACULTY | 100 MARKS. | |
| 2. ASSESSMENT BY INDUSTRIAL GUIDE | 100 MARKS. | |
| 3. CONDUCT MARKS | 100MARKS. | **300** |

TOTAL **500**

**YMCA University of Science & Technology, Faridabad**
**New Scheme of Studies & Examination**
**B.Tech IV$^{th}$ Year (Electronics Instrumentation & Control Engineering)**
**Semester – VIII**

| Course No. | Course Title | Teaching Schedule | | | | Marks of Class Work | Examination | | Total Marks | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | | Theory | Practical | | |
| E-402 | Digital Signal Processing | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-404 | Embedded System Design | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-406 | Operation Research | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-408 | Robotics Engg. & Automation | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-410 | Fuzzy Control System | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-412A<br>or<br>EIC-412B<br>or<br>EIC-412C<br>or<br>EIC-412D | Stochestic Process<br>or<br>Intelligent Instrumentation<br>or<br>Micro Sensors<br>or<br>Adaptive Control | 4 | - | - | 4 | 40 | 60 | - | 100 | 04 |
| EIC-414 | Robotics Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| E-416 | Digital Signal Processing Lab | - | - | 2 | 2 | 30 | - | 20 | 50 | 01 |
| EIC-420 | Major Project | - | - | 4 | 4 | 60 | - | 40 | 100 | 02 |
| EIC-422 | Workshop-VIII | - | - | 8 | 8 | 120 | - | 80 | 200 | 04 |
| | **TOTAL** | **24** | **-** | **16** | **40** | **480** | **360** | **160** | **1000** | **32** |

**E-201** **Mathematics-III**

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

**Part-A**

**Unit1. Complex Variables:**

Functions of complex variable,continuity, Derivative. Cauchy-Riemann equations, Analytic Function Harmonic functions, Integration of complex functions. cauchy theorem and cauchy‘s integral formula. Taylor's and Laurent's series, singularities, Residues, residue theorem, calculation of residues,evaluation of real definite integrals (around unit and semi circle only).

**Unit2. Fourier series:**

Euler‘s formulae, conditions for a Fourier expansion,fourier expansion of functions having points of discontinuity, change of interval, Fourier expansion of odd and even functions, half range series. Parseval‘s formula, practical harmonic analysis

**Part-B**

**UNIT3. PARTIAL DIFFERENTIAL EQUATIONS:**

Formation, solution. Linear partial differential Equations of the first order. Integral surfaces passing through a given curve.non-linear partial differential equations of the first order. Charpit‘s method. Classification of linear second order equations. Euler‘s equations. Linear equations with constant co-efficients.method of separation of variables. Applications to the wave equation, one dimensional heat flow, two dimensional heat flow .laplace equation(two dimensional) and laplace equation in polar co-ordinates.

**UNIT4. FOURIER TRANSFORM:**

Fourier transform-fourier sine and cosine transforms. Properties of F-transforms.convolution theorem.perseval’s identity,relation between fourier and laplace transform. Fourier transforms of the derivatives of function. Applications to boundary value problem.

**TEXT BOOKS :**


1. Advanced Engg. Mathematics : F Kreyszig. Wiely Estern Ltd.
2. Higher Engg. Mathematics : B.S. Grewal, Khanna Publishers, New Delhi


**REFERENCE BOOKS :**


1. Advanced Engg. Mathematics: Michael D. Greenberg.
2. Operation Research: H.A. Taha.
3. Probability and statistics for Engineers : Johnson. PHI

## E-203 Electrical Engineering Materials and Semiconductor Devices

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

### UNIT 1 CONDUCTING MATERIALS:
Review of energy bands, description of materials, drift velocity, collision time, Mean free path, mobility, conductivity, relaxation time, factors affecting conductivity of materials, types of thermal conductivity, Wiedmann-Franz law, super conductivity, effect of magnetic field, conducting materials, applications.

### UNIT 2 DIELECTRIC MATERIALS:
Behaviour of dielectric materials in static electric field, Dipole moments, Polarization, Dielectric constant, Polarizability, Susceptibility, mechanisms of polarization, behaviour in alternating field, dielectric loss, loss tangent, types of dielectric & insulating materials, electrostriction, Piezo-electricity, Applications.

### UNIT 3 MAGNETIC MATERIALS:
Permeability, Magnetic susceptibility, magnetic moment, Magnetization, Dipole moment, types of magnetic materials, Magnetostriction, eddy current & hysteresis losses, applications.

### UNIT 4 SEMICONDUCTORS:
Review of Si and Ge as semiconducting materials, Intrinsic and extrinsic semiconductors, Effect of temperature on Intrinsic and extrinsic semiconductors. Continuity Equation, P-N junction, P-N Junction diode: V-I characteristics, static and dynamic resistance, Ideal Diode, Drift & Diffusion current, Diffusion & Transition capacitances of P-N junction, breakdown mechanism : Zener and avalanche breakdown.

### UNIT 5 CONSTRUCTION AND CHARACTERISTICS OF DEVICES:
Brief introduction to Planar Technology for device fabrication., metal -semiconductor junctions (ohmic and non-ohmic), Zener diode, Zener diode as constant voltage regulator, electrical and optical excitation in diodes: LED, solar cells and photo-detectors.

### UNIT 6 CONSTRUCTION AND CHARACTERISTICS OF BIPOLAR AND MOS DEVICES :

BJT:CB, CE,CC configuration, current amplification factors and their relationship , comparison of CB, CC,CE, Transistor amplifying action, UJT, UJT as relaxation oscillator, Comparison between: BJT/FET, JFET/MOSFET JFET, JFET parameters, MOSFETS: depletion and enhancement type.

### UNIT 7 POWER DEVICES : CONSTRUCTION AND CHARACTERISICS
Thyristor, Two transistor analogy of thyristor, Diac, Triac, GTO, IGBT, VMOS

### TEXT BOOKS:

1. Electrical Engineering Materials: A.J. Dekker; PHI.
2. Solid State Electronic Devices : StreetMan & Banerjee; Pearson.
3. Electronic Devices & Circuits: Millman & Halkias; MGH.


### REFERENCE BOOKS:

1. Electrical Engineering Materials: S.P Seth & P.V Gupta; Dhanpat Rai.
2. Power Electronics : P.S Bhimra : Khanna Publications
3 Electronic Devices & Circuit Theory : Boylestad & Nashelsky; Pearson.
4. Semiconductor devices: Jaspreet Singh; John Wiley.
5. Basic Electronics and linear circuits: N N Bhargava, Kuls

## E-205 Network Analysis and Synthesis

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

**UNIT-1**
Introduction to lumped element electrical systems,Dual networks,Solution to some typical problems,Thevenin's and Norton theorem,equivalent circuits.Analogus system Electrical analogus to mechanical translational and rotational system. f-v analogy, f-I analogy.

**Unit 2**
Transients:
Transient response of simple R - L, R - C and R - L - C series and parallel circuits using classical differential equation approach and Laplace Transform method. Response of RL, RC, RLC circuits for impulse and pulse and non sinusoidal periodic functions, excitations using Laplace Transform method.

**UNIT 3** NETWORK FUNCTIONS :
Terminal pairs or Ports, Network functions for one-port and two-port networks, poles and zeros of Network functions, Restrictions on pole and zero Locations for driving point functions and transfer functions, Time domain behaviour from the pole-zero plot.

**UNIT 4** CHARACTERISTICS AND PARAMETERS OF TWO PORT NETWORKS :
Relationship of two-port variables, short-circuit Admittance parameters, open circuit impedance, parameters, Transmission parameters, hybrid parameters, relationships between parameter sets, Inter-connection of two port networks.

**UNIT 5** TOPOLOGY :
Principles of network topology , graph matrices, network analysis using graph theory.

**UNIT 6** TYPES OF FILTERS AND THEIR CHARACTERISTICS :
Filter fundamentals, high-pass, low-pass, band-pass, and band-reject Filters.

**UNIT 7** NETWORK SYNTHESIS :
Positive real functions, synthesis of one port and two port networks, elementary ideas of Active networks.

TEXT BOOKS:

1. Network Analysis & Synthesis : Umesh Sinha; Satya Prakash Pub.
2. Network Analysis & Synthesis : F.F.Kuo; John Wiley & Sons Inc.
3.Network Analysis: Van Valkenburg; PHI

REFERENCE BOOKS:

1. Introduction to Modern Network Synthesis : Van Valkenburg; John Wiley
2. Basic circuit theory: Dasoer Kuh; McGraw Hill.
3. A Course in Electrical Circuit Analysis by Soni & Gupta; Dhanpat Rai Publication.
4. Circuit Analysis : G.K. Mithal; Khanna Publication.
5. Networks and Systems : D.Roy Choudhury; New Age International.

## EIC-207 Electromechanical Energy Conversion

| L T P Cr | | |
|---|---|---|
| 4 0 0 4 | **Theory** | **: 60 Marks** |
| | **Class work** | **: 40 Marks** |
| | **Total** | **: 100 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

**UNIT1 ELECTROMECHANICAL ENERGY CONVERSION:**
Principles Of Force and torque in magnetic field system, energy balance, energy and force in singly excited magnetic field system, concept of co-energy, forces and torques in system with permanent magnets, dynamic equation.

UNIT 2 TRANSFORMERS :
Basic theory, construction , operation at no-load and full-load, equivalent circuit, phasor diagram, O.C. and S.C. tests for parameters determination, efficiency and regulation, auto-transformer, introduction to three-phase transformer ; Current and Potential Transformers : Principle, construction, analysis and applications.

UNIT 3 DC MACHINES :
Basic theory of DC generator, brief idea of construction, emf equation, load characteristics, basic theory of DC motor, concept of back emf, torque and power equations, load characteristics, starting and speed control of DC motors, applications.

UNIT 4 INDUCTION MOTOR:
Basic theory, construction, Phasor diagram, Equivalent circuit, Torque equation, Load characteristics, starting and speed control of induction motor, Introduction to single phase Induction motor and its applications, Fractional H.P. Motors, Introduction to stepper, servo reluctance and universal motors.

UNIT 5 SYNCHRONOUS MACHINES:
Construction and basic theory of synchronous generator, emf equation, model of generator, Phasor diagram, Regulation, Basic theory of synchronous motor, v-curves, synchronous condenser, applications.

TEXT BOOK:
1. Electrical Machines: Nagarath and Kothari; TMH

REFERENCE BOOKS:
1. Electrical Machines :P.S. Bimbhra; Khanna
2. Electrical Machines: Mukherjee and Chakravorti; Dhanpat Rai & Sons
3. Electrical Technology (Vol-II) : B.L Theraja; S. Chand.

## E-209 Electrical Measurements and Measuring Instruments

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

**UNIT 1 UNITS STANDARDS AND ERRORS:**
S.I. units, Absolute standards (International, Primary, Secondary, and Working standards),True Value, Errors(Gross, Systematic and Random); Static Characteristic of instruments( Accuracy, Precision, Sensitivity, Resolution and threshold).

**Unit 2 . MEASURING SYSTEM FUNDAMENTALS:**
Classification of Instruments (based upon mode of measurement- Indicating , Recording and Integrating Instruments), Generalized Instrument ( block diagram and description of various blocks ) , the three forces in an electromechanical indicating instrument ( deflecting controlling and damping forces and the interplay between them), Comparison between gravity and spring controls : Comparison of methods of damping and their suitability for bearing supports , Pivot –less supports ( simple suspension and taut band suspension , scale , information , instrument cases ( covers ) .

**UNIT 3 . MEASURING INSTRUMENTS:**
Construction , Operating principle , torque equation , shape of scale , use as Ammeter or as voltmeter ( Extension of range) , use on AC / DC or both , advantages and disadvantages, errors(both on AC/DC)of PMMC types, electrodynamic type, moving iron type(attraction , Repulsion and combined attraction, repulsion types). Hot Wire type and induction type, electrostatic type instruments.

**UNIT 4. WATTMETERS AND ENERGY METERS :**
Construction, Operating principle, Torque Equation, Shape of Scale, Errors, Advantages and Disadvantages of Electrodynamic and induction type watt meters; and single phase induction type energy meter, compensation and creep in energy meter.

**UNIT 4. INTRUMENT TRANSFORMERS:**
Current and Voltage Transformer, constructional features, ratio and phase angle errors.

**UNIT 5 . LOW AND HIGH RESISTANCE MEASUREMENTS:**
Limitations of wheatstone bridge , Kelvin‘s double Bridge method , difficulties in high resistance measurements , measurement of high resistance by direct deflection , Loss of Charge method , Megohm Bridge and Meggar .

**UNIT 6. A.C. BRIDGES:**
General Balance equation, Circuit Diagram, Phasor Diagram, Advantages, Disadvantages and Application of Maxwell‘s inductance, Maxwell‘s inductance capacitance bridge, Hay‘s, Anderson‘s, Owen‘s, De-sauty‘s, Schering and Wein‘s Bridges, Shielding and Earthing.

**TEXT BOOK:**
A course in Electrical and Electronic measurement and instrumentation: A.K. Sawhney, Dhanpat Rai Publication

**REFERENCE BOOKS:**

1. ELECTRICAL MEASUREMENTS: E.W. GOLDING
2. Electrical And Electronic measurement and instrumentation : J.B. Gupta, Kataria and Sons.
3. Electronic instrumentation and measurement technique : W.D. Cooper & A.D. Helfrick
4. Measuring systems : E.O. Doeblin; TMH.

## E-211 Analog Electronics

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

**UNIT 1 SEMICONDUCTOR DIODE & DIODE CIRCUITS:**
Diode as a circuit element, Load line concepts, half wave & Full wave rectifier, Filter circuits (Capacitor & Inductor Filter), Clipping circuits, clamping circuits, Peak to peak detector, Voltage multiplier circuit.

**UNIT 2 TRANSISTOR AT LOW FREQUENCIES:**
Bipolar junction transistor operation, Characteristics, Analysis of a transistor amplifier circuits using h-parameters, emitter follower, Miller's theorem.

**UNIT3 TRANSISTOR BIASING:**
Operating point, Selection of operating point, bias stability, Stability factor, Different methods for transistor biasing: fixed bias, collector to base bias, emitter bias, voltage divider biasing, compensation techniques (thermistor & Sensistor compensation).

**UNIT4 TRANSISTOR AT HIGH FREQUENCIES:**
Hybrid P model, CE short circuit gain, frequency response, alpha cut off frequency, Gain Bandwidth product, Emitter follower at high frequencies .

**UNIT5 FET & FET CIRCUITS:**
Junction field effect transistor, Pinch off voltage, Volt ampere characteristics, small signal model, common source amplifier, source follower, biasing of FET, application of FET as voltage variable resistance.

**UNIT6 REGULATED POWER SUPPLY:**
Block Diagram of Power supply, Voltage regulation, Series and Shunt voltage regulator, IC Regulator.

**TEXT BOOKS:**
1 .Integrated Electronics: Millman & Halkias ; McGrawHill
2. Electronic circuit analysis and design (Second edition): D.A.Neamen; TMH

**REFERENCE BOOKS:**
1. Electronics Principles: Malvino ; McGrawHill
2. Electronics Circuits: Donald L. Schilling & Charles Belove ; McGrawHill
3. Electronics Devices & Circuits: Boylestad & Nashelsky ; Pearson.

## E-213 Network Analysis and Synthesis Lab

| L T P Cr | | |
|---|---|---|
| 0 0 2 1 | **Internal Marks** | **: 30 Marks** |
| | **External Marks** | **: 20 Marks** |
| | **Total** | **: 50 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

**LIST OF EXPERIMENTS:**

1. Transient response of RC circuit.
2. Transient response of RL circuit.
3. To find the resonance frequency, Band width of RLC series circuit.
4. To calculate and verify "Z" parameters of a two port network.
5. To calculate and verify "Y" parameters of a two port network.
6. To determine equivalent parameter of parallel connections of two port network.
7. To plot the frequency response of low pass filter and determine half-power frequency.
8. To plot the frequency response of high pass filter and determine the half-power frequency.
9. To plot the frequency response of band-pass filter and determine the band-width.
10. To calculate and verify "ABCD" parameters of a two port network.
11. To synthesize a network of a given network function and verify its response.
12. Introduction of P-Spice

NOTE : Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

## E-217 Electrical Measurement and Measuring Instruments Lab

| L T P Cr | | |
|---|---|---|
| 0 0 2 1 | **Internal Marks** | **: 30 Marks** |
| | **External Marks** | **: 20 Marks** |
| | **Total** | **: 50 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

**LIST OF EXPERIMENTS:**

1. Measurement of displacement using LVDT.
2. Measurement of distance using LDR.
3. Measurement of temperature using R.T.D.
4. Measurement of temperature using Thermocouple.
5. Measurement of pressure using Strain Guage.
6. Measurement of pressure using Piezo-Electric Pick up.
7. Measurement of distance using Capacitive Pick up.
8. Measurement of distance using Inductive Pick up.
9. Measurement of speed of DC Motor using Magnetic Pick up.
10. Measurement of speed of DC Motor using Photo Electric Pick up.

NOTE :

1. At least ten experiments have to be performed in the semester.
2. At least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

## E-215 Electrical Machine-1Lab.

| L T P Cr | | |
|---|---|---|
| 0 0 2 1 | **Internal Marks** | **: 30 Marks** |
| | **External Marks** | **: 20 Marks** |
| | **Total** | **: 50 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

**LIST OF EXPERIMENTS:**

1. To study construction and starting methods of DC motor.
2. To obtain magnetization characteristics of separately excited DC Machine.
3. To obtain magnetization characteristics of self-excited DC Machine.
4. To obtain Load characteristics D.C series generator.
5. To obtain Load characteristics of D.C Shunt Generator.
6. To obtain Load characteristics test on D.C Compound Generator.
7. To obtain speed torque characteristics of DC shunt motor.
8. Speed control of DC shunt motor by field control method
9. Speed control of DC shunt motor by armature voltage control method
10. Load test on DC shunt motor.
11. Load test on DC Series Motor
12. To obtain efficiency of dc machine using Swinburne‘s Test.
13. To perform Hopkinson‘s test and determine losses and efficiency of DC machine.
14. To perform parallel operation of DC shunts generators.
15. Field Test

Note: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

## E-219 Analog Electronics Lab

| L T P Cr | | |
|---|---|---|
| 0 0 2 1 | Internal Marks | : 30 Marks |
| | External Marks | : 20 Marks |
| | Total | : 50 Marks |
| | Duration of Exam | : 3 Hrs. |

**List of Experiments**

1. Study of Half wave & full wave rectifiers.
2. Study of power supply filters.
3. Study of Diode as clipper & clamper.
4. Study of Zener diode as a voltage regulator.
5. Study of CE amplifier for voltage, current & Power gains and input, output impedances..
6. Study of CC amplifier as a buffer.
7. To study the frequency response of RC coupled amplifier.
8. Study of 3-terminal IC regulator.
9. Study of transistor as a constant current source in CE configuration.
10. Study of FET common source amplifier.
11. Study of FET common Drain amplifier.
12. Graphical determination of small signal hybrid parameters of bipolar junction transistor.
13. Study & design of a d.c. voltage doubler.

NOTE : At least ten experiments are to be performed, atleast seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

**MGMT-201** **ECONOMICS FOR ENGINEERS**

| L T P CR | CLASS WORK : | 40 |
|---|---|---|
| 4 - - 4 | EXAM : | 60 |
| | TOTAL : | 100 |

**Unit I**

Introduction to the subject: Micro and Macro Economics, Relationship between Science, Engineering, Technology and Economic Development. Production Possibility Curve, Nature of Economic Laws.

**Unit II**

Time Value of Money: concepts and application. Capital budgeting; Traditional and modern methods, Payback period method, IRR, ARR, NPV, PI (with the help of case studies)

**Unit III**

Meaning of Demand. Law of Demand, Elasticity of Demand; meaning, factors effecting it and its practical application and importance. Demand forecasting (a brief explanation) **Unit IV**

Meaning of Production and factors of production, Law of variable proportions and returns to scale. Internal and external economies and diseconomies of scale. Concepts of cost of production, different types of costs; accounting cost, sunk cost, marginal cost, Opportunity cost. Break even analysis, Make or Buy decision (case study). Relevance of Depreciation towards industry.

**Unit V**

Meaning of market, types of market, perfect competition, Monopoly, Monopolistic, Oligopoly. (main features). Supply and law of supply, Role of demand and supply in price determination.

**Unit VI**

Indian Economy, nature and characteristics. Basic concepts; fiscal and monetary policy, LPG, Inflation, Sensex, GATT, WTO and IMF. Difference between Central bank and Commercial banks

**Books**


1. Jain T.R., Economics for Engineers, VK Publication
2. Chopra P. N., Principle of Economics, Kalyani Publishers
3. Dewett K. K., Modern economic theory, S. Chand
4. H. L. Ahuja., Modern economic theory, S. Chand
5. Dutt Rudar & Sundhram K. P. M., Indian Economy
6. Mishra S. K., Modern Micro Economics, Pragati Publications
7. Pandey I.M., Financial Management; Vikas Publishing House
8. Gupta Shashi K., Management Accounting, Kalyani Publication

## E-204 Electronics Instrumentation

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

UNIT 1. OSCILLOSCOPE:
Block diagram, study of various stages in brief, high frequency CRO considerations. Sampling and storage oscilloscope.

UNIT 2. ELECTRONIC INSTRUMENTS:
Instruments for measurement of voltage, current & other circuit parameters, Q-meters, R.F. power measurements, introduction to digital meters.

UNIT 3. GENERATION & ANALYSIS OF WAVEFORMS:
Block diagram of pulse generators, signal generators, function generators wave analysers, distortion analysers, spectrum analyser, Harmonic analyser, introduction to power analyser.

UNIT 4. FREQUENCY & TIME MEASUREMENT:
Study of decade counting Assembly(DCA), frequency measurements, period measurements, universal counter, introduction to digital meters.

UNIT 5. DISPLAY DEVICES:
Nixie tubes, LED‘s LCD‘s, discharge devices.

UNIT 6 TRANSDUCERS:
Classification, Transducers of types: RLC photocell, thermocouples etc. basic schemes of measurement of displacement, velocity, acceleration, strain, pressure, liquid level & temperature.

UNIT 7 INTRODUCTION TO SIGNAL CONDITIONING:
DC signal conditioning system, AC signal conditioning system, data acquisition and conversion system

TEXT BOOK:
1. A course in Electrical & Electronics Measurements & Instrumentation : A.K.Sawhney; Dhanpat Rai & Sons.
REFERENCE BOOKS.
1. Electronics Instrumentation & Measurement Techniques : Cooper; PHI.

**E-206** **Computational Techniques**

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

## PART-A

### UNIT1 FINITE DIFFERENCES AND INTERPOLATION:

Various difference operators and relation between them .Newton‘s forward and backward interpolation formulae. Central difference interpolation formula. Gauss forward and backward interpolation formulae. Langrages interpolation formula and Newton‘s divided difference formulae.

### UNIT2 SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:

Bisection method, method of false position,secant method, iteration method, Newton's Raphson method, Generalised Newton-Raphson method

### UNIT3 SOLUTIONS OF SIMULTANEOUS ALGEBRIC EQUATIONS:

Jacobi's method, Gauss-Seidal method, Relaxation method.

### UNIT4 NUMERICAL DIFFERENTIATION AND INTEGRATION:

Formula for derivatives Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rules, Boole's rule and Weddle's rule, Romberg's Integration.

## PART-B

### UNIT5 NUMERICAL SOLUTION OF O.D.E:

Taylor series,Picard‘s method, Eule , Modified Euler method, Runge-Kutta second and fourth order methods, predictor collector methods(Adams-Bashforth and Milne's method only),

### UNIT6 NUMERICAL SOLUTION OF P.D.E:

Finite difference approximations of partial derivatives, solution of Laplace equation (Standard 5-point formula only), one-dimensional heat equation (Schmidt method, Crank-Nicolson method, Dufort and Frankel method) and wave equation.

TEXT BOOKS :

1. Applied Numerical Analysis : Curtis F. Gerald and Patrick & G. Wheatley-Pearson, Education Ltd.
2. Numerical Method : E. Balagurusamy T.M.H.

REFERENCE BOOKS :

1. Numerical Methods for Scientific and Engg. Computations : M.K. Jain, S.R.K. Iyenger and R.K. Jain-Wiley Eastern Ltd.
2. Introductory Methods of Numerical Analysis S.S. Sastry, P.H.I.
3. Numerical Methods in Engg. & Science : B.S. Grewal.

**E-208** **Digital Electronics**

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

## UNIT 1 FUNDAMENTALS OF DIGITAL TECHNIQUES:

Digital signal, logic gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean algebra. Review of Number systems. Binary codes: BCD, Excess-3, Gray, EBCDIC, ASCII, Error detection and correction codes.

## UNIT 2 COMBINATIONAL DESIGN USING GATES:

Design using gates, Karnaugh map and Quine Mcluskey methods of simplification.

## UNIT 3 COMBINATIONAL DESIGN USING MSI DEVICES

Multiplexers and Demultiplexers and their use as logic elements, Decoders, Adders / Subtractors, BCD arithmetic circuits, Encoders, Decoders / Drivers for display devices.

## UNIT 4 SEQUENTIAL CIRCUITS:

Flip Flops : S-R, J-K, T, D, master-slave, edge triggered, shift registers, F/F Conversions, sequence generators, Counters, Asynchronous and Synchronous Ring counters and Johnson Counter, Design of Synchronous and Asynchronous sequential circuits.

## UNIT 5 DIGITAL LOGIC FAMILIES:

Switching mode operation of p-n junction, bipolar and MOS. devices. Bipolar logic families:RTL, DTL, DCTL, HTL, TTL, ECL, MOS, and CMOS logic families. Tristate logic, Interfacing of CMOS and TTL families.

## UNIT 6 A/D AND D/A CONVERTERS:

Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for
D/A converters. A/D converters : Quantization, parallel -comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.

## UNIT 7 MEMORIES AND PLD'S

Classification of memories –RAM organization l-Bipolar RAM cell – MOSFET RAM cell –Dynamic RAM cell – ROM- PROM –EPROM –EEPROM –EAPROM –Programmable Logic Devices –Programmable Logic Array (PLA)- Programmable Array Logic (PAL)-Field Programmable Gate Arrays (FPGA).

## TEXT BOOK:

1. Modern Digital Electronics(Edition III) : R. P. Jain; TMH

## REFERENCE BOOKS:

1. Digital Integrated Electronics: Taub & Schilling; MGH
2. Digital Principles and Applications: Malvino & Leach; McGraw Hill.
3. Digital Design: Morris Mano; PHI.

## EIC-210 Control Systems-I

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

UNIT1. INTRODUCTORY CONCEPTS :
System/Plant model, types of models, illustrative examples of plants and their inputs and outputs, servomechanism, regulating system, Synchros, AC and DC techo-generators, servomotors, stepper motors, & their applications, magnetic amplifier.
linear time-invariant (LTI) system, time-varying system, causal system, open loop control system, closed loop control system, illustrative examples of open-loop and feedback control systems, continuous time and sampled data control systems. Effects of feedback on sensitivity (to parameter variations), stability, external disturbance (noise), overall gain etc. Introductory remarks about non-linear control systems.

UNIT2. MATHEMATICAL MODELLING :
Concept of transfer function, relationship between transfer function and impulse response, order of a system, block diagram algebra, signal flow graphs : Mason's gain formula & its application, characteristic equation, derivation of transfer functions of electrical and electromechanical systems. Transfer functions of cascaded and non-loading cascaded elements. Introduction to state variable analysis and design.

UNIT3. TIME DOMAIN ANALYSIS :
Typical test signals, time response of first order systems to various standard inputs, time response of 2nd order system to step input, relationship between location of roots of characteristics equation, w and wn, time domain specifications of a general and an under-damped 2nd order system, steady state error and error constants.Effect of adding pole-zero to a system,controllers.

UNIT 4: Stability in time domain: Necessary and sufficient conditions for stability, Hurwitz stability criterion, Routh stability criterion and relative stability, Root Locus technique for stability.

UNIT5. FREQUENCY DOMAIN ANALYSIS :
Relationship between frequency response and time-response for 2nd order system, polar, Nyquist, Bode plots, stability, Gain-margin and Phase Margin, relative stability, frequency response specifications.

UNIT6. COMPENSATION :
Necessity of compensation, compensation networks, application of lag and lead compensation.

**Text Book:**

1. Control System Engineering : I.J.Nagrath & M.Gopal; New Age
2. Modern Control Engg : K.Ogata; PHI.

**Reference Books :**

1. Automatic Control Systems : B.C.Kuo, PHI.
2. Control Systems - Principles & Design : Madan Gopal; Tata Mc Graw Hill.
3. Modern Control Engineering.R.C.Dorl & Bishop; Addison-Wesley

## E-212 Electromagnetic Field Theory

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

UNIT1.STATIC ELECTRIC FIELDS:
Coulomb‘s Law, Introduction to Del operation, Study of Del operation on scalar and vector and its physical interpretation, Laplacian operator, Stoke‘s Theorem and Divergence Theorem, Gauss‘s Law, potential function, field due to a continuous distribution of charge, equi-potential surfaces, Poison‘s equation, Laplace‘s equation, method of electrical images, capacitance, electro-static energy, boundary conditions, the electro-static uniqueness theorem for field of a charge distribution, Dirac-Delta representation for a point charge and an infinitesimal dipole.

UNIT2. STEADY MAGNETIC FIELDS:
Faraday Induction law, Ampere‘s Work law in the differential vector form, Ampere's law for a current element, magnetic field due to volume distribution of current and the Dirac-delta function, Ampere‘s Force Law, boundary conditions for magnetostatic, magnetic vector potential, scalar vector potential (Alternative derivation).

UNIT3. TIME VARYING FIELDS:
Introduction to conduction current, convection current and displacement current; Equation of continuity for static and time varying fields, inconsistency of Ampere‘s law, Maxwell‘s field equations and their interpretation, solution for free space conditions, electromagnetic waves in a homogeneous medium, Discussion on : Group velocity, Phase velocity, Attenuation constant, Phase constant, Refractive index; propagation of uniform plane-wave, relation between E & H in a uniform plane-wave, wave equations for conducting medium, Maxwell‘s equations using phasor notation, wave propagation in a conducting medium, Loss Tangent, conductors, dielectrics, wave propagation in good conductor and good dielectric, depth of penetration, polarization, linear, circular and elliptical,

UNIT4. REFLECTION AND REFRACTION OF E M WAVES:
Reflection and refraction of plane waves at the surface of a perfect conductor & perfect dielectric (both normal incidence as well as oblique incidence), Brewester's angle and total internal reflection, reflection at the surfaces of a conductive medium, surface impedance, transmission-line analogy, poynting theorem, interpretation of E x H, power loss in a plane conductor.

UNIT5.TRASMISSION LINE THEORY :
Transmission line as a distributed circuit, Primary and Secondary constant, Transmission line equation, input impedance of terminated line, infinite transmission line, Distortion less and Loss less transmission line, Open circuit and short circuit transmission line, Reflection coefficient, Standing waves, VSWR, Smith's chart and its applications.

**Text Book:**
1. Electro-magnetic Waves and Radiating System: Jordan & Balmain, PHI.

**Refrence Books:**
1. Engineering Electromagnetics : Hayt; TMH
2. Electro-Magnetics : Krauss J.DF; Mc Graw Hill.
3. Priciples of Electromagnetics; Matthew N.O. Sadiku; Oxford publications

## E-216 Digital Electronics Lab

| L T P Cr | | |
|---|---|---|
| 0 0 2 1 | Internal Marks | : 30 Marks |
| | External Marks | : 20 Marks |
| | Total | : 50 Marks |
| | Duration of Exam | : 3 Hrs. |

### List of Experiments

1. Study of TTL gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.

2. Design & realize a given function using K-maps and verify its performance.

3. To verify the operation of multiplexer & Demultiplexer.

4. To verify the operation of comparator.

5. To verify the truth tables of S-R, J-K, T & D type flip flops.

6. To verify the operation of bi-directional shift register.

7. To design & verify the operation of 3-bit synchronous counter.

8. To design and verify the operation of synchronous UP/DOWN decade counter using J K flip-flops & drive a seven-segment display using the same.

9. To design and verify the operation of asynchronous UP/DOWN decade counter using J K flip-flops & drive a seven-segment display using the same.

10. To design & realize a sequence generator for a given sequence using J-K flip-flops.

11. Study of CMOS NAND & NOR gates and interfacing between TTL and CMOS gates.

12. Design a 4-bit shift-register and verify its operation . Verify the operation of a ring counter and a Johnson counter.

NOTE : At least ten experiments are to be performed, atleast seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

## EIC-218 Control Systems Lab

| L T P Cr | | |
|---|---|---|
| 0 0 2 1 | Internal Marks | : 30 Marks |
| | External Marks | : 20 Marks |
| | Total | : 50 Marks |
| | Duration of Exam | : 3 Hrs. |

### List of Experiments

1. To study A.C. servo motor and to plot its torque-speed characteristics.
2. To study D.C. servo motor and to plot its torque-speed characteristics
3. To study the magnetic amplifier and to plot its load current v/s control current characteristics for (a) Series connected mode (b) parallel connected mode.
4. To plot the load current v/s control current characteristics for self exciting mode of the magnetic amplifier.
5. To study the synchro and to plot stator voltage v/s rotor angle for synchro transmitter i.e. to use the synchro transmitter as position transducer.
6. (a) Use the synchro pair (synchro transmitter and control transformer) as an error detector.
   (b) To use the synchro pair ( synchro transmitter and synchro motor) as a torque transmitter.
7. To familiarize with the module such as OP-amp unit, attenuator unit, pre-amp unit, servo amplifier, power supply, motor unit, input and output potentiometers, load unit etc.
8. To illustrate a simple motor driven open loop position control system.
9. To illustrate a simple motor driven closed loop position control system.
10. To study and demonstrate simple closed loop speed control system.
11. To study the lag compensator and to draw magnitude and phase plots for these.
12. To draw the magnitude an phase plots for lead and lag-lead compensators.
13. To study a stepper motor and to execute micro-processor or computer based control of the same b changing no. of steps, direction of rotation and speed.
14. To implement a PID controller for level control of a pilot plant.
15. To implement a PID controller for temperature control of a pilot plant.
16. To plot transient responses to step inputs for stable and unstable systems using MATLAB. Plot stator voltage v/s voltage angle for synchro-transmitter i.e. to use the synchro-transmitter as position transducer.

## E-214 Computational Technique Lab

| L T P Cr | | |
|---|---|---|
| 0 0 2 1 | **Internal Marks** | **: 30 Marks** |
| | **External Marks** | **: 20 Marks** |
| | **Total** | **: 50 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

WRITE DOWN AND EXECUTE THE FOLLOWING PROGRAMS USING C/C++/MATLAB

1. To find the roots of non-linear equation using Bisection method.
2. To find the roots of non-linear equation using Newton's method.
3. Curve fitting by least - square approximations.
4. To solve the system of linear equations using Gauss-Elimination method.
5. To solve the system of linear equations using Gauss-Seidal iteration method.
6. To solve the system of linear equations using Gauss-Jorden method.
7. To Integrate numerically using Trapezoidal rule.
8. To Integrate numerically using Simpson's rules.
9. To find the largest eigen value of a matrix by power-method.
10. To find numerical solution of ordinary differential equations by Euler's method.
11. To find numerical solution of ordinary differential equations by Runge-Kutta method.
12. To find numerical solution of ordinary differential equations by Milne's method.
13. To find the numerical solution of Laplace equation.
14. To find numerical solution of wave equation.
15. To find numerical solution of heat equation.

NOTE: At least 10 experiments have to be performed with at least 7 from above list. Remaining three may either be performed from 3 above list or designed and set by concerned institution as per scope of syllabus.

## EIC-301 Transducers and Signal Conditioning

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

**UNIT 1: Introduction:**
Definition, Application and types of measurements, Instrument classification, Functional elements of an instrument, Input/output configuration of measuring instruments, Methods of correction for interfering and modifying inputs, Standards, Calibration, Introduction to Static characteristics and Dynamic characteristics, Selection of instruments, Loading effects.

**UNIT 2: Transducers:**
Overview, primary and secondary transmissions, active and passive transmissions.
Inductive Transducers: LVDT, RVDT and uses. Transducers using L, Mu(u), G,N and reluctance change,
Capacitive Transducers: Use of changes in A, d, Ed(epsilon), differential arrangement
Resistive Transducers: Potentiometers, loading effect, power rating linearity and sensitivity, helipots, strain gauges, unbounded and bounded types, wire and foil strain gauges.
Measurement of linear and rotatory displacements, strain, linear and angular velocities, liquid level and flow, thickness and temperature.
Piezoelectric and their Dynamic performance. Fiber optic sensors, Biochemical sensors, Hall Effect, Photoemissive, Photo Diode/ Photo Transistor, Photovoltaic, Strain Gauge Digital transducers: Principle, Construction, Encoders, Absolute and incremental encoders, Silicon micro transducers.

**UNIT 3: Signal Conditioning**
Instrumentation Amplifier characteristics, CMRR, balanced modulator and demodulator, filters, voltage sensitive bridge and current sensitive bridge. Push-pull transducers, Blumlein bridge, integration, differentiation and sampling, A/D and D/A conversion, choppers, voltage to time A/D conversion, voltage to frequency conversion concept and methods.

TEXTBOOKS:
1. A course in Electrical and Electronic Measurement and Instrumentation: AK Sawhney; Dhanpat Rai.

REFERENCE BOOKS:
1. Measurement systems: E.O. Doeblin; TMH
2. Electronic Instrumentation and measurement Techniques: W.D. Cooper and A.D. Helfrick; PHI

## EIC-303 Non-Linear Control Systems

| L T P Cr | |
|---|---|
| 4 0 0 4 | |

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

UNIT 1: INTRODUCTION: Non linear components such as dead band, backlash, relay, saturation. Difficulties in non-linear modeling and control.

UNIT 2: PHASE LINE ANALYSIS: Phase portraits of second order systems, method of isoclines, phase portrait of second order system with non linearities, limit cycles, singular points.

UNIT 3: DESCRIBING FUNCTION ANALYSIS: Definition, limitations, use of DF for stability analysis, DF of ideal relay, relay with hysteresis, dead zone, saturation, Coulomb friction, backlash etc.

UNIT 4: STATE VARIABLE TECHNIQUES: State space modelling, state transition matrix, state models for linear continuous time systems, state variables and linear discrete time systems. Diagonalisation, solution of state equations, conversion of state variable model to transfer function, conversion of transfer function to canonical state variable model, concept of controllability and observability, test for controllability and observability.

UNIT 5: LYAPUNOV STABILITY ANALYSIS:
Introduction, basic concepts, stability definitions, stability theorems, Lyapunov function for non-linear systems and linear systems. Model reference adaptive system, discrete time system.

UNIT 6: Discrete time system and Z transform methods:
Introduction to discrete time system**,** the Z transform, solution of difference equations, inverse Z transform, pulse transfer function, Stability analysis in Z plane.

TEXTBOOKS:

1. Control System Engg. (Third edition): I.J. Nagrath and M. Gopal; New Age International

REFERENCE BOOKS:

1. Control Systems Principles and Designs (second edition): M. Gopal; TMH
2. Digital Control and State Variable Methods: M. Gopal ; TMH

## E-305 Analog Integrated Circuits

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

**UNIT1. SINGLE AND MULTISTAGE AMPLIFIERS:**
Classification of amplifiers, distortion in amplifiers, frequency response of an amplifier, step response of an amplifier, pass-band of cascaded stages, RC-coupled amplifier, low frequency response of RC coupled stage, effect of an emitter bypass capacitor on low Frequency response, multistage CE amplifier.

**UNIT2. FEEDBACK AMPLIFIERS:**
Feedback concept, transfer gain with feedback, general characteristics of negative feedback amplifiers, input resistance, output resistance, voltage series feedback, current series feedback, current shunt feedback, voltage shunt feedback.

**UNIT3. OSCILLATORS:**
Sinusoidal oscillators, Barkhausen criteria, R-C phase shift oscillator, generalform of oscillator circuit, wien-bridge oscillator, crystal oscillator.

**UNIT4. POWER AMPLIFIERS:**
Class A, B, and C operations; Class A large signal amplifiers, higher order harmonic distortion, efficiency, transformer coupled power amplifier, class B amplifier : efficiency & distortion; class A and class B push-pull amplifiers; Cross over distortion, Class C power amplifier.

**UNIT5. OPERATIONAL AMPLIFIERS:**
Ideal and practical operational amplifiers, inverting and non-inverting amplifier, differential amplifier, emitter coupled differential amplifier, transfer characteristics of a differential amplifier, offset error : voltage and current, common mode rejection ratio (CMRR) .

**UNIT6. LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS:**
Scale changer, phase shifter, adder, voltage to current converter, current to voltage converter, DC voltage follower, Bridge amplifier, AC coupled amplifier, AC voltage follower, Integrator, differentiator.

**UNIT7. NON-LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS:**
Comparators sample & hold circuits, Logarithmic amplifier, anti-log amplifier, logarithmic multiplier, waveform generators, regenerative comparator (Schmitt Trigger), multivibrators , 555 timer IC (monostable & Astable operation) & its application.

**TEXT BOOKS:**

1. Integrated Electronics: Milman Halkias, TMH.
2. Operational Amplifiers:Gaikwad


**REFERENCE BOOKS:**

1. Electronic Circuit Analysis and Design ( Second edition) : D.A.Neamen; TMH
2. Integrated Circuits: K R Botkar.
3. Linear Integrated Circuits : D R Chaudhary (WEL)

## CE-203 Data Structures

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

**Part-A**

**Overview of 'C':** Introduction , Flow of Control, Input output functions, Arrays and Structures, Functions
**Data structures and Algorithms: an overview**: concept of data structure, choice of right data structures, types of data structures, basic terminology Algorithms, how to design and develop an algorithm: stepwise refinement, use of accumulators and counters; algorithm analysis, complexity of algorithms Big-oh notation.
**Arrays: Searching Sorting**: Introduction, One Dimensional Arrays,
**Operations Defined:** traversal, selection, searching, insertion, deletion, and sorting. Multidimensional arrays, address calculation of a location in arrays.
**Searching:** Linear search, Recursive and Non recursive binary Search.
**Sorting:** Selection sort, Bubble sort, Insertion sort, Merge sort, Quick sort, Shell sort, Heap sort
**Stacks and queues**: Stacks, array representation of stack, Applications of stacks. Queues, Circular queues, array representation of Queues, Deque, priority queues, Applications of Queues.

**Part-B Pointers and Linked Lists;**

**Pointers**: Pointer variables, Pointer and arrays, array of pointers, pointers and structures, Dynamic allocation.
**Linked Lists**: Concept of a linked list,. Circular linked list, doubly linked list, operations on linked lists. Concepts of header linked lists. Applications of linked lists, linked stacks, linked Queues.

**Part-C Trees and Graphs**

**Trees**: Introduction to trees, binary trees, representation and traversal of trees, operations on binary trees, types of binary trees, threaded binary trees, B Trees, Application of trees.
**Graphs**: Introduction, terminology, _set, linked and matrix' representation, Graph traversal techniques: BFS, DFS, operations on graphs, Minimum spanning trees, Applications of graphs.

**Part-D File Handling and Advanced data Structure**

Introduction to file handling, Data and Information, File concepts, File organization, files and streams, working with files. AVL trees, Sets, list representation of sets, applications of sets, skip lists

## Text Books:


1 Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.
2 Data Structures using C by A. K. Sharma, Pearson


**Reference Books:**


1 Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.
2 Fundamentals of Data structures by Ellis Horowitz & Sartaj Sahni, Pub, 1983,AW
3 Fundamentals of computer algorithms by Horowitz Sahni and Rajasekaran.
4 Data Structures and Program Design in C By Robert Kruse, PHI,
5 Theory & Problems of Data Structures by Jr. Symour Lipschetz, Schaum's outline by TMH
6 Introduction to Computers Science -An algorithms approach , Jean Paul Tremblay, Richard B. Bunt, 2002, T.M.H.

**E-309** **Power Electronics**

| L T P Cr | |
|---|---|
| 4 0 0 4 | **Theory : 60 Marks** |
| | **Class work : 40 Marks** |
| | **Total : 100 Marks** |
| | **Duration of Exam : 3 Hrs.** |

**Unit1 Introduction:** Introduction to Thyristors, Their static and dynamic characteristics, Turn-on and Turn - off methods and circuits, Ratings and protection of SCR'S, Other members of thyristor family, Series and parallel operation of thyristors, Firing circuits for SCRs.Commutation circuits

**Unit2 Phase Controlled Converters:** Principle of phase control, Single phase half wave circuit with different types of loads, Single phase and three phase semi converter and full converter bridge circuits with line commutation, Continuous and discontinuous conduction effect of source inductance on single phase and three phase full converters, Single phase and three phase dual converters and their operation with circulating and non circulating currents.

**Unit3 DC Choppers:** Principle of chopper operation, Control strategies, Types of choppers, Step upand step down choppers, Types of choppers, Steady state time domain analysis with R, L, and E type loads, Voltage, Current and Load commutated choppers.

**Unit4 Inverters:** Single phase VSI, Half bridge and full bridge inverters and their steady state analysis,Introduction of Series and parallel inverters, and Three phase bridge inverters with $180^0$ and $120^0$ modes. Single-phase PWM inverters. Current source inverters,CSI with R load (qualitative approach).

**Unit5 AC Voltage Controllers:** Types of single-phase voltage controllers, Single-phase voltage controller with R and RL type of loads. Three phase voltage controller configurations R Load.

**Unit6 Cycloconverters:** Principles of operation, Single phase to single phase step up and step down cycloconverters. Three phase to single phase and three-phase to three-phase cycloconverters, Output voltage equation for a cycloconverter.

## Text Books

1. Dubey, G.K., Doradla, S.R., Joshi, A. and Sinha, R.M.K., Thyristorised Power Controllers, New Age International (P) Limited, Publishers (2004).
2. Rashid, M., Power Electronics, Prentice−Hall of India (2006) 3rd ed.
3.Bhimbra P.S. ,Power Electronics,Khanna Publisher.

## Reference Book

1. Mohan, N., Underland, T. and Robbins, W. P., Power Electronics: Converter Applications and Design, John Wiley (2007) 3rd ed.

## E-311 Microprocessors and Interfacing

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

**Part A**

UNIT1. Architecture of 8085:
Functional block diagram—Registers, ALU, Bus systems. Pin configuration, Timing and control signals, Machine cycle and timing diagrams. Interrupts—Types of interrupt, interrupt structure.
UNIT2. Programming of 8085:
Instruction format, Addressing modes, Instruction set. Development of assembly language programs.

**Part B**

UNIT3. Interfacing Devices:
(a).The 8255 PPI chip: Architecture, pin configuration, control words, modes and Interfacing with 8085.
(b). The 8254 PIC chip: Architecture, pin configuration, control words, modes and Interfacing with 8085.
UNIT4. Interrupt and DMA controller:
(a). The 8259 Interrupt controller chip: Architecture, pin configuration, control words, modes
(b). The 8257 DMA controller chip: Architecture, pin configuration, control words, modes

**Part C**

UNIT5. Architecture of 8086:
Functional block diagram of 8086, details of sub-blocks such as EU, BIU, memory segmentation, physical address computations, pin configuration, program relocation, Minimum and Maximum modes of 8086— Block diagrams and machine cycles.
Interrupts—Types of interrupt, interrupt structure.
UNIT6. Programming of 8086:
Instruction format, Addressing modes, Instruction set. Development of assembly language programs. Assembler directives.

**TEXT BOOKS:**
1. Microprocessor Architecture, Programming & Applications with 8085 : Ramesh S Gaonkar; Wiley Eastern Ltd.
2. Microprocessor and applications – A.K.Ray.

**REFERENCE BOOKS:**
1. Microprocessors and interfacing : Hall; TMH
2. The 8088 & 8086 Microprocessors-Programming, interfacing,Hardware & Applications :Triebel & Singh; PHI
3. Microcomputer systems: the 8086/8088 Family: architecture, Programming & Design : Yu-Chang Liu & Glenn A Gibson; PHI.
4. Advanced Microprocessors and Interfacing : Badri Ram; TMH

## EL-315 Power Electronics Lab

**L T P Cr**
**0 0 2 1**

**Internal Marks : 30 Marks**
**External Marks : 20 Marks**
**Total : 50 Marks**
**Duration of Exam : 3 Hrs.**

1. To plot characteristics of Diode , Thyristor and Triac .
2. To plot characteristics of Transistor and MOSFET .
3. To Use R and R-C firing circuits , UJT firing circuit .
4. Study of complementary voltage commutation using a lamp flasher , Ring Counter .
5. Study of Thyristorised DC circuit breaker .
6. Study of AC voltage Regulator .
7. Study of full wave Converter .
8. Study of DC chopper .
9. Study of Series Inverter.
10. Study of Bridge Inverter .
11. Study of Single phase Cycloconverter .

NOTE : At least 10 Experiments are to be performed , with at least 7 from above list , remaining 3 may be performed from above list or designed and set by concerned institution as per scope of syllabus .

## E-317 Microprocessors and Interfacing Lab

| L T P Cr | | |
|---|---|---|
| 0 0 2 1 | **Internal Marks** | **: 30 Marks** |
| | **External Marks** | **: 20 Marks** |
| | **Total** | **: 50 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

List of Experiments:

1. Study of architecture of 8085 & familiarization with its hardware , commands & operation of Microprocessor kit.

2. Write a program using 8085 and verify for :
   a. Addition of two 8-bit numbers.
   b. Addition of two 8-bit numbers (with carry).

3. Write a program using 8085 and verify for :
   a. 8-bit subtraction (display borrow)
   b. 16-bit subtraction (display borrow)

4. Write a program using 8085 for multiplication of two 8- bit numbers by repeated addition method. Check for minimum number of additions and test for typical data.

5. Write a program using 8085 for multiplication of two 8- bit numbers by bit rotation method and verify.

6. Write a program using 8085 for division of two 8- bit numbers by repeated subtraction method and test for typical data.

7. Write a program using 8085 for dividing two 8- bit numbers by bit rotation method and test for typical data.

8. Write a program using 8086 and verify for:
   a. Finding the largest number from an array.
   b. Finding the smallest number from an array.

9. Write a program using 8086 for arranging an array of numbers in descending order and verify.
10. Write a program using 8086 for arranging an array of numbers in ascending order and verify.
11. Write a program for finding square of a number using look-up table and verify.
12. Write a program to interface microprocessor with 8253 to generate square wave. Use 8085/8086 microprocessor.
13. Write a program to interface microprocessor with 8253 to generate interrupt on terminal count. Use 8085/8086 microprocessor.
14. Write a program to interface a two digit number using seven-segment LEDs. Use 8085/8086 microprocessor and 8255 PPI.
15. Write a program to control the operation of stepper motor using 8085/8086 microprocessor and 8255 PPI.

## E-319 Analog Integrated Circuits Lab

| L T P Cr | | |
|---|---|---|
| 0 0 2 1 | **Internal Marks** | **: 30 Marks** |
| | **External Marks** | **: 20 Marks** |
| | **Total** | **: 50 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

LIST OF EXPERIMENTS:

1. Design & measure the frequency response of an RC coupled amplifier using discrete components.

2. Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth

3. Study the effect of voltage series, current series, voltage shunt, and current shunt feed-back on amplifier using discrete components.

4. Design & realize inverting amplifier, non-inverting and buffer amplifier using 741 Op Amp.

5. Verify the operation of a differentiator circuit using 741 op amp and show that it acts as a high pass filter.

6. Verify the operation of a integrator circuit using 741 op amp and show that it acts as a low pass filter.

7. Design and verify the operations of op amp adder and subtractor circuits.

8. Plot frequency response of AC coupled amplifier using op amp 741 and study the effect of negative feedback on the bandwidth and gain of the amplifier.

9. Design & realize using op amp 741,Wein -bridge oscillator.

10. To design & realize using op amp 741, square wave generator.

11. To design & realize using op amp 741, logarithmic amplifier & VCCS.

**E-302 Digital System Design**

| L T P Cr | |
|---|---|
| 4 0 0 4 | |

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

## UNIT1. INTRODUCTION TO HDL:

Design flow, Design Methodologies, Capabilities, Hardware abstraction, Model analysis.
Basic VHDL elements—Identifiers, data objects, data classes, data types, Operators.

## UNIT2. TYPES OF MODELLINGS:

Behavioural modelling—Entity declaration, Architecture body, Various Sequential statements and constructs. Multiple processes, Postponed processes.
Dataflow modelling—Concurrent signal assignment statements, delta delay model, multiple drivers, block statement, concurrent assertion statement.
Structural modelling—Component Declaration, component instantiation, resolving signal values.

## UNIT3. COMBINATIONAL CIRCUIT DESIGN:

VHDL Models and Simulation of combinational circuits such as Multiplexers, Demultiplexers, encoders, decoders, code converters, comparators, implementation of Boolean functions etc.

## UNIT4. SUPPORTING CONSTRUCTS:

Generics, Configuration, subprogram overloading, operator overloading, Package declaration, package body, design libraries, visibility, Introduction to Test bench. Subprograms: Application of Functions and Procedures.

## UNIT5. SEQUENTIAL CIRCUITS DESIGN:

VHDL Models and Simulation of Sequential Circuits such as flip-flops,
Shift Registers, Counters etc.

## UNIT6. PROGRAMMABLE LOGIC DEVICES:

ROM, PLA, PAL, GAL, CPLD and FPGA. Designing using ROM, PLA and PAL.

## TEXT BOOKS:

1. "A VHDL Primmer": Bhasker; Prentice Hall 1995.
2. Modern Digital Electronics- III Edition: R.P Jain; TMH (2003).

## REFERENCE BOOKS:

1. IEEE Standard VHDL Language Reference Manual (1993).
2. Digital Design and Modelling with VHDL and Synthesis : KC Chang; IEEE Computer Society Press.
3. "Digital System Design using VHDL" : Charles. H.Roth ; PWS (1998).
4. "VHDL-Analysis & Modelling of Digital Systems" : Navabi Z; McGraw Hill.
5. VHDL-IV Edition :Perry; TMH (2002)
6. "Introduction to Digital Systems" : Ercegovac. Lang & Moreno; John Wiley (1999).
7. Fundamentals of Digital Logic with VHDL Design : Brown and Vranesic; TMH (2000)

## EIC-304 Telemetry Data Processing and Recording

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

Unit 1: Introduction:
Overview: Block diagram of a generalized instrument and description of its various blocks.

Unit 2: Telemetry:
Modes of data transmission, DC telemetry system, voltage telemetry system, current telemetry system, AC telemetry system, AM, FM, Phase modulation, pulse telemetry system, PAM, Pulse frequency system, pulse duration modulation(PDM), digital telemetry, pulse code modulation, transmission channels and media, wire line channels, radio channels, micro wave channels, power line carrier channels, multiplexing in telemetry systems, TDM.

Unit 3: REMOTE SENSING:
Electromagnetic radiation, Energy interactions, Energy recording technology, Across track and along track scanning, Resolution, Multispectral remote sensing, Thermal remote sensing, Hyper Spectral Remote sensing, Microwave Remote sensing, LIDAR, Earth resource satellites, Application of remote sensing.

Unit 4: Data Processing And Recording:
Digital v/s analog processing, quantization, aperture, electronic counters, RS Flip Flop, Decade counter, digital display methods, SS display, LED, LCD, nixie tubes, decade counting assembly (DCA), decimal decoders, BCD to SS converter, BCD to Dot-matrix converter, resolution and sensitivity and accuracy in digital meters.

TEXTBOOKS:


1. Lillesand, M.T. and Ralph, W., Remote Sensing and Image Interpreation, John Wiley (2004) 6th ed.
2. Patranabis, P., Telemetry Principles, Tata McGraw−Hill Publishing Company (2004) nd ed.
3. Swobada, G., Telecontrol Method and Application of Telemetering and Remote Control, Von Nostrand, (1971).
4. A Course in Electrical and Electronics Measurements and Instrumentation: A.K. Sawhney; Dhanpat Rai


RFEERENCE BOOKS


1. Measurement Systems and Analysis, E.O. Doeblien; TMH
2. Electronics Instrumentation and Measurement Techniques, W.D. Cooper and A.D. Helfrick

**EIC-306** **Computer Networks**

| L T P Cr | | |
|---|---|---|
| 4 0 0 4 | **Theory** | **: 60 Marks** |
| | **Class work** | **: 40 Marks** |
| | **Total** | **: 100 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

## UNIT 1 INTRODUCTION:

Uses of Computer Networks, Network Hardware and Software, Reference models (OSI & TCP/IP).

## UNIT 2 THE PHYSICAL LAYER:

The Theoretical basis for Data communication, Transmission media, Wireless Communication, Communication Satellites, Network topology, switching techniques.

## UNIT 3 THE DATA LINK LAYER:

Data Link Layer Design issues, Error Detection & correction, Elementary Data Link layer protocols, Sliding Window Protocols, Protocol Specification & Verification, Example of Data Link Protocols.

**THE MEDIUM ACCESS SUBLAYER:** Channel Allocation, Multiple access Protocols (ALOHA, CSMA, FDM, TDM).

## UNIT4 NETWORK LAYER:

Design issues, routing algorithms, congestion control, and internetworking.

## UNIT 5

**TRANSPORT LAYER:** Design issues, simple transport protocols (TCP, UDP)

**SESSION LAYER**: Design issues, remote procedure calls.

## UNIT 6:

**PRESENTATION LAYER**: Design issues, data compression technique, cryptograph.

**APPLICATION LAYER**: Design issues, file transfer, access and management, electronic mail, virtual terminals, applications and examples.

## TEXT BOOKS:


1. Tanenbaum A.S, Computer Networks, PHI.
2. Forouzan B.A, Data Communications and Networking, Tata-Mc-Graw Hill.
3. Stallings W, Data and Computer Communications, PHI.


## REFERENCE BOOKS;


1. Ahuja V, Design and Analysis of Computer Communication, McGraw Hill.
2. Bee K.C.S, Local Area Networks, NCC Pub.
3. Davies D. W. Barber, Computer Networks and their Protocols, John Wiley.

## EIC-308 Computer Based Instrumentation and Control

| L T P Cr | Theory : 60 Marks |
|---|---|
| 4 0 0 4 | Class work : 40 Marks |
| | Total : 100 Marks |
| | Duration of Exam : 3 Hrs. |

**UNIT 1 : INTRODUCTION**

Necessity and function of computers. Level of automation : Classical approach and computer based plant automation : On line and Off line. Centralized computer control and Distributed computer control.

**UNIT 2 : INTERFACING**

Sampling , Multiplexing, need of multiplexing, A/D converter, D/A converters, interfacing of A/D converter and D/A converters with microprocessor/microcomputer, programmable communication interface 8251 USART, Serial communication and serial communication standards: RS 232, MODEM, Bus arbitration, Current loop.

**UNIT 3 : STRUCTURAL STUDY OF AUTOMATIC PROCESS CONTROL:**

Fundamentals of automatic process control, building blocks of automatic system, Distributed control system (DCS) : characteristics, functional levels/ system architecture, SCADA system. Direct digital control (DDC): structure, DDC software : position and velocity algorithm, Dual computer and basic concept of DDC,

**UNIT 4 : PROGRAMMABLE LOGIC CONTROL**

Evolution of PLC, Block diagram, Different components of PLC, Principle of operation, PLC Scan cycle, Programming of PLC : Instruction set including NO, NC, Set, Reset, Timer, Counter, data transfer, Mathematical and logical functions, LIFO, FIFO, Jump, Bit shift instructions etc., PLC selection Process, Application and software of PLCs.

**UNIT 5 : MODELING AND SIMULATION FOR PLANT AUTOMATION**

Basic concept, need of modeling and simulation, building of mathematical model of a plant, Modern tools for modeling and simulation.

**UNIT 6 : INDUSTRIAL CONTROL APPLICATIONS :**

Plant automation: cement plant, thermal power plant, steel plant and water treatment plant.

**Recommended Books:**

1. Anand, M.M.S., Electronic Instruments and Instrumentation technology, Prentice−Hall of India (2006).
2. Krishna Kant , Computer based industrial Control PrenticeHall of India.(2005)
3. Liptak B.G., Process control: Instrument engineers‘ Handbook, Butterwirth Heinemann (2003) 4th ed.

**EIC-310** **Industrial Process Control**

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

UNIT 1 BASIC CONSIDERATIONS:

Introduction to process control system, control loop study-Generalisation with load-changes at arbitrary points in the loop ,offset and its analysis,modeling consideration for control purposes, degree of freedom and process controllers ,formulating the scope at modeling for process control.dynamic behaviour of first order lag system,process with variable time constant and gain.Dynamic behaviour of 1st order lag system,process with variable time constant and gain. Dynamic behaviour of first order lag system-multicapacity process,real time process,inverse response process,inytroduction to feedback control and effects P,I& D controllers.

UNIT 2: DESIGNING FEEDBACK CONTROLLER:
Outline of the design problems,selection of type of feedback controller.Time-integral performance criterion, process reaction curve and frequency response characteristic,Ziegler-Nichole rule,effect of dead-time,dead time compensator inverse response compensator.

UNIT 3: CONTROL SYSTEM WITH MULTIPLE LOOPS
Cascade,split-range feedforward, ratio inferential and adaptive control.

UNIT 4:INTERACTION AND DE-COUPLING OF CONTROL LOOP
Interaction of control loops,relative gain array and selection of the loops,design of non-interacting current loop.

UNIT 5:COMPUTER PROCESS INTERFACE FOR DATA ACQUISITION AND CONTROL
Introduction to digital computer control of processes. Design of control system for complete plant.

TEXT BOOK
Chemical process control; George Stephanopoulos;PHI
REF BOOKS
1.Digital computer process control;C.L.Smith;Intext Educational publisher
2.Process control: F.G.Shinskey; McGraw Hill
3.Advanced process control: W.H.Ray: McGraw Hill]
4.Process system and analysis and control: D.R.Coushanour; T.M.H
5.Process instrument and control handbook: D.M.Considins; McGraw Hill

## EIC-312 Bio-Medical Instrumentation

| L T P Cr | | |
|---|---|---|
| 4 0 0 4 | **Theory** | **: 60 Marks** |
| | **Class work** | **: 40 Marks** |
| | **Total** | **: 100 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

UNIT 1:INTRODUCTION
Origin of bio-electric signals, recording systems, source of low-level recording circuits, preamplifiers, main amplifier, driver stage, writing systems, types of recorder and transducers used

UNIT 2: BIO-MEDICAL RECORDERS AND DISPLAY SYSTEMS
ECG, EEG, EMG, Phono-cardiograph and electrodes used for ECG, EEG, EMG, Phono cardiograph, oscilloscopes used for bio-medical measurements, multi, channel display

UNIT 3: BLOOD GAS ANALYSERS
BP measurement, patient monitoring system .

UNIT 4: SPECIAL MACHINES
MRI and ultrasonic imaging systems, X-Ray machines, X-Ray computed tomography, basic NMR components, physics of ultrasonic rays, A-Scanner, B-Scanner, Echo-cardiography, display devices for ultrasonic imagery.

UNIT 5: CARDIAC PACEMAKERS AND DEFIBRILLATORS
External pacemaker, implantable pacemaker, programmable pacemaker, leads and electrodes used, DC defibrillators, electrodes used, implantable defibrillators

UNIT 6:BIO TELEMETRY
Introduction to bio telemetry, physiological parameters adaptable to bio telemetry, the components of bio telemetry system, implantable units, applications of telemetry in patient care

UNIT 7: LASER APPLICATIONS IN BIO-MEDICAL FIELDS
LASERS: Ruby Laser, Argon Laser, He-Ne Laser, $CO_2$ Laser, Nd-YAG Laser,

TEXTBOOKS:
1.Introduction to Bio-Medical Instrumentation: R.S. Khandpur
2.Bio-Medical Instrumentation: Crambell

**EIC-316** **Network Programming Lab.**

| L T P Cr | | |
|---|---|---|
| 0 0 2 1 | **Internal Marks** | **: 30 Marks** |
| | **External Marks** | **: 20 Marks** |
| | **Total** | **: 50 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

The socket programming can be done on Unix/Linux operating or/and Windows. Socket programming, and the language can be C/VC++ and/or Java

1. Write a program to implement parity check.
2. Write a program to implement hamming code.
3. Write a program to implement two dimensional parity checks.
4. Write a program to determine the type of IP Address.
5. Write a program to implement slotted aloha.
6. Write a program to make an FTP Client.
7. Write a program to implement an adhock network.
8. To make cross and normal cable connection.
9. To implement a socket address.
10. To implement a lan.

## E-318 Digital System Design Lab

| L T P Cr | | |
|---|---|---|
| 0 0 2 1 | **Internal Marks** | **: 30 Marks** |
| | **External Marks** | **: 20 Marks** |
| | **Total** | **: 50 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

1. Design all gates using VHDL.
2. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
   a. half adder
   b. full adder
3. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
   a. multiplexer
   b. demultiplexer
4. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
   a. decoder
   b. encoder
5. Write a VHDL program for a comparator and check the wave forms and the hardware generated
6 Write a VHDL program for a code converter and check the wave forms and the hardware generated
7. Write a VHDL program for a FLIP-FLOP and check the wave forms and the hardware generated
8. Write a VHDL program for a up/down counter and check the wave forms and the hardware generated
9. Write a VHDL program for a mod-n counter and check the wave forms and the hardware generated
10. Write VHDL programs for the following circuits check the wave forms and the hardware generated
   a. Storage register
   b. Shift register
11. Write a VHDL program for ALU of microcomputer and check the wave forms and the hardware generated
12. Implement any three (given above) on FPGA/CPLD kit

**EIC-314** **Electronics Circuits Simulation Lab**

| **L T P Cr** | | |
|---|---|---|
| **0 0 2 1** | **Internal Marks** | **: 30 Marks** |
| | **External Marks** | **: 20 Marks** |
| | **Total** | **: 50 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

LIST OF EXPERIMENTS:

1. Simulate and study half-wave, full-wave, and bridge-rectifier using PSPICE windows
2. Simulate and study diode clipper and clamper circuits using PSPICE windows
3. Simulate and study emitter bias and fixed bias BJT and JFET circuits using PSPICE windows, and determine quiescent conditions.
4. Simulate a common emitter amplifier using self biasing and study the effect of variation in emitter resistor on voltage gain , input and output impedance using PSPICE windows .
5. Determine the frequency response of Vo/Vs for CE BJT amplifier using PSPICE windows. Study the effect of cascading of two stages on band width.
6. Simulate and study Darlington pair amplifier circuit using PSPICE windows and determine dc bias and output ac voltage .
7. Study an operational amplifier using PSPICE windows and find out: CMMR, gain band width product, slew rate, 3-db frequency, and input offset voltage.
8. Simulate and study active low pass, high pass, and band pass filters using PSPICE windows.
9. Simulate and study class A, B, C, and AB amplifier using PSPICE windows.
10. Study the operation of 555 timer oscillator using PSPICE.
11. Simulate logic expression……..and determine its truth table.
12. Simulate logic expression of full adder circuit and determine its truth table.
13. Simulate a synchronous 4-bit counter and determine its count sequence.
14. Simulate a master-slave flip-flop using NAND gates and study its operation. Study the operation of asynchronous preset and clear.

**E-402 Digital Signal Processing**

| L T P Cr | | |
|---|---|---|
| 4 0 0 4 | **Theory** | **: 60 Marks** |
| | **Class work** | **: 40 Marks** |
| | **Total** | **: 100 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

## UNIT1. DISCRETE-TIME SIGNALS:

Signal classifications, frequency domain representation, time domain representation, representation of sequences by Fourier transform, properties of Fourier transform, discrete time random signals, energy and power theorems.

## UNIT2. DISCRETE-TIME SYSTEMS:

Classification, properties, time invariant system, finite impulse Response (FIR) system, infinite impulse response (IIR) system.

## UNIT3. SAMPLING OF TIME SIGNALS:

Sampling theorem, application, frequency domain representation of sampling, reconstruction of band limited signal from its samples. Discrete time processing of continuous time signals, changing the sampling rate using discrete time processing.

## UNIT4. Z-TRANSFORM:

Introduction, properties of the region of convergence, properties of the Z-transform, inversion of the Z-transform, applications of Z-transform.

## UNIT5. BASICS OF DIGITAL FILTERS:

Fundamentals of digital filtering, various types of digital filters, design techniques of digital filters : window technique for FIR, bi-linear transformation and backward difference methods for IIR filter design, analysis of finite word length effects in DSP,FIR &IIR Filter structure-direct1,direct2,cascadeand parallel,
Application of DSP.

## UNIT6. MULTIRATE DIGITAL SIGNAL PROCESSING:

Introduction to multirate digital signal processing, sampling rate conversion, filter structures, multistage decimator and interpolators, digital filter banks.

## TEXT BOOKS :

1. Digital Signal Processing : Proakis and Manolakis; PHI
2. Digital Signal Processing: Salivahanan, Vallavaraj and Gnanapriya;TMH

## REFERENCE BOOKS:

1. Digital Signal Processing: Alon V. Oppenhelm;PHI
2. Digital Signal processing(II-Edition): Mitra, TMH

**EIC-404** **Embedded System Design**

| L T P Cr | | |
|---|---|---|
| 4 0 0 4 | Theory | : 60 Marks |
| | Class work | : 40 Marks |
| | Total | : 100 Marks |
| | Duration of Exam | : 3 Hrs. |

## UNIT1. INTRODUCTION:

Different types of Micro-controllers, embedded micro-controller, external memory micro-controller, Processor architectures: Harvard vs Princeton, CISC vs. RISC, Micro-controller memory types.
Development tools/environment, Intel Hex Format object files, debugging.

## UNITS2 ARCHITECTURE OF 8051:

Block diagram, pin Configuration, Functional descriptions of internal
Units-- registers, PSW, internal RAM, ROM, Stack, Oscillator and Clock. **Other features**--I/O Pins, Ports and Circuits, Counters and timers, Serial data transmission /reception.
**Interrupts**--Timer flag interrupt, serial communication interrupt, External interrupt, software generated interrupts.

## UNIT3. PROGRAMMING OF 8051:

Instruction format, addressing modes, Data transfer instructions, logical instructions, arithmetic instructions, Jump and Call instructions. Interrupts and interrupt handler subroutines. Development of assembly Language programs

## UNIT4. ARCHITECTURE OF PIC:

Block diagram, pin Configuration, Functional descriptions of internal blocks—program memory considerations, register file structure. registers, oscillators and clock.
**Other features**--I/O Pins, Counters and timers, Watchdog timer, SPI port USART.
**Interrupts**—Interrupt structure.

## UNIT5. APPLICATION DESIGN & HARDWARE INTERFACING WITH 8051 & PIC:

Hardware Interfacing with LED, Seven segment LED, LCD, Switches and stepper motor.

## TEXT BOOKS:


1. Design with PIC Micro-controller by John B. Peatman, Pearson.
2. The 8051 microcontroller and embedded system by M.A.Mazidi, PHI


## REFERENCE BOOKS:


1. Programming and customizing the 8051 micro-controller- Predko, TMH.
2. Designing Embedded Hardware: John Catsoulis: Shroff Pub and Dist.
3. Programming embedded systems in C and C++: Michael Barr: Shroff Pub and distr.

**EIC-406** **Operation Research**

| **L T P Cr** | | |
|---|---|---|
| **4 0 0 4** | **Theory** | **: 60 Marks** |
| | **Class work** | **: 40 Marks** |
| | **Total** | **: 100 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

Part-A

Different types of o.r. models, their construction and general methods of solution. Linear Programming problem-Formulation and graphical solution. The standard form of the L.P.model. The simplex method. Thedual of L.P.P. Primal-dual relation ship. Dual simplex method. Sensitivity analysis. Transportation problem, its solution and applications. Theassignment model. Travelling salesman problem.

Part-B

Network minimisation. Shortest route problem. Maximum flow problem. Project of scheduling by PERT, CPM Critical path calculations. Construction of the time chart and resource leveling, Integer programming-examples, method of and algorithms [cutting plane algorithm only] Dynamic Programming- Examples of D.P.models. Bellman‘s Principle of optimality and method of recursive optimization [ simple problems only involving upto one constraint]

Books Suggested:


1. Taha H.A Operations Research-An Introduction, PHI
2. Wanger H.M, Principles of Operation Research, PHI

## EIC-408 Robotics Engineering and Automation

| L T P Cr | |
|---|---|
| 4 0 0 4 | |

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

**Fundamentals**: historical information, robot components, Robot characteristics, Robot anatomy, Basic structure of robots, Resolution, Accuracy and repeatability

**Robot Kinematics** : Position Analysis forward and inverse kinematics of robots, Including frame representations, Transformations, position and orientation analysis and the Denavit−Hartenberg representation of robot kinematics, The manipulators, The wrist motion and grippers.

**Differential motions, Inverse Manipulator Kinematics:** Differential motions and velocity analysis of robots and frames.

**Robot Dynamic Analysis and Forces:** Analysis of robot dynamics and forces, Lagrangian mechanics is used as the primary method of analysis and development.

**Trajectory Planning:** Methods of path and trajectory planning, Both in joint−space and in Cartesian−space.

**Actuators and Sensors:** Actuators, including hydraulic devices, Electric motors such as DC servomotors and stepper motors, Pneumatic devices, as well as many other novel actuators, It also covers microprocessor control of these actuators, Mechatronics, Tactile sensors, Proximity and range sensors, Force and torque sensors, Uses of sensors in robotics

**Robot Programming, Systems and Applications**: Robot languages, Method of robots programming, Lead through programming methods, A robot programs as a path in space, Motion interpolation, WAIT, SIGNAL and DELAY commands, Branching capabilities and limitation of lead through methods and robotic applications.

**Fuzzy Logic Control:** Basic principles of fuzzy logic and its applications in microprocessor control and robotics.

**Recommended Books**

1. Gonzalez, R. C., Fu, K. S. and Lee, C.S.G., Robotics Control Sensing, Vision and Intelligence, McGraw Hill (1987).
2. Koren,Y., Robotics for Engineers, McGraw Hill (1985).
3.Niku, S.B., Introduction to Robotics, Analysis, Systems, Applications, Dorling Kingsley (2006).
4.Predko, M., Programming robot controllers, McGraw Hill (2002).

## EIC-410 Fuzzy Control System

**L T P Cr**
**4 0 0 4**

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

UNIT 1: INTRODUCTION
Fuzzy control from an industrial perspective, knowledge based controllers, knowledge representation in KBC's.

UNIT 2: THE MATHEMATICS OF FUZZY CONTROL
Vagueness, fuzzy logic v/s probability theory, fuzzy sets, their properties and operations on fuzzy sets, fuzzy relations and operations on fuzzy relations, the Extension principle, fuzzy propositions, the compositional rule of inference, different implications, representing a set of rules

UNIT 3: FKBC DESIGN PARAMETERS
The PKBC architecture, choice of variables and content of rules, derivation of rules, choice of membership functions, choice of scaling factors, choice of fuzzification procedure, choice of defuzzification procedure, comparison and evaluation of defuzzification methods.

UNIT 4: NON LINEAR FUZZY CONTROL
The control problem, the FKBC as a non-linear transfer element, types of FKBC such as PID-like FKBC, sliding mode FKBC, SUGENO FKBC.

UNIT 5:ADAPTIVE FUZZY CONTROL
Design and performance evaluation, approaches to design such as membership function tuning using gradient descent, membership function tuning using performance criteria, the self organizing controller, model based controller.

UNIT 6:STABILITY OF FUZZY CONTROL SYSTEMS
The state approach, stability and robustness indices, input output stability, circle criterion, the conicity criterion.

TEXTBOOK
An Introduction to Fuzzy Control: D.Driankov, H. Hellendoorn and M. Reinfrank; Narosa

REFERENCE BOOKS
Fuzzy Control Systems; Abraham Kandel and Gideon Imngholz; Narosa

## EIC-412A Stochastic Processes

| L T P Cr | | |
|---|---|---|
| 4 0 0 4 | **Theory** | **: 60 Marks** |
| | **Class work** | **: 40 Marks** |
| | **Total** | **: 100 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

**UNIT 1 Probability :**Set definitions and set operations, Axioms of probability Joint and conditional probability , Independent events Combined experiments Bernoulli trials ,total probability and Bayes Theorem

**UNIT 2 Random Variables** The random variable ,concept CDF, PDF Some Important r. v.'s, Conditional distribution and density functions, Expectation ,Moments, Characteristic function ,random process of one random variable Properties of joint distribution and joint density, Conditional distribution , Expected value of a function of r. v.'s , Joint characteristic functions

**UNIT3 Random Processes** – Concept of a random process, Stationarity and independence ,Correlation functions and their properties Gaussian random process Poisson random process , Power Spectral Density and its properties ,Relationship between PSD and autocorrelation function

**UNIT 4 Estimation**: Introduction, development of parameter estimators, estimation of stochastic processes, applications. Least –square estimation. Linear least squares problem, generalized least square problem. Sequential least squares, non-linear least squares theory.

**UNIT5 Characteristics of estimators**: Sufficient statistics, Good estimators. Analysis of estimation errors. Mean square and minimum variance estimators.

**UNIT6 Maximum a posteriori and maximum likelihood estimators**. Numerical solution of least – Maximum a posteriori and maximum likelihood estimators. Numerical solution of least – squares and maximum likelihood estimation problems. Sequential estimators

TEXT BOOKS:

1. Childers, Probability and random processes, The McGraw-Hill companies Inc., 1997.
2. Harold W. Sorenson, Parameter Estimation, Principles and Problems, Marcel Dekker Inc., 1980.

## EIC-412 B Intelligent Instrumentation

| L T P Cr | | |
|---|---|---|
| 4 0 0 4 | **Theory** | **: 60 Marks** |
| | **Class work** | **: 40 Marks** |
| | **Total** | **: 100 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

UNIT 1: INTRODUCTION:
Definition of an intelligent instrumentation system: Static and Dynamic characteristics of intelligent instrumentation; feature of intelligent instrumentation; Block Diagram of an intelligent instrumentation.

UNIT 2: INSTRUMENTATION/COMPUTER NETWORKS:
Serial & parallel interfaces; serial communication standards; parallel data bus; EEE 488bus; Local area networks (LANs): Star networks, Ring & bus networks, Fiber optic distributed networks.

UNIT 3: VIRTUAL INSTRUMENTATION:
Introduction to graphical programming data flow & graphical programming techniques, advantage of Virtual Instrumentation techniques, Virtual Instrumentations and sub Virtual Instrumentation loops and charts, arrays, clusters and graphs, case and sequence structure, formula notes, string and file Input/Output.

UNIT 4: INTRERFACING INSTRUMENTS & COMPUTERS:
Basic issues of interfacing; Address decoding; Data transfer control; A/D converter, D/A converter; other interface consideration.
UNIT5: ANALYSIS TECHNIQUE:
DSP software, Measurement filters and wavelets, windows, curve fitting probability and statistics.

TEXT BOOKS:

1. Intelligent instrumentation :G.C. Barney: PHI
2. Labview for every one: Lisa, K. Wells and Jeffery Travis: PHI

REFRENCES;

1. Principles of measurement & instrumentation: Alan S. Moris; PHI
2. Labview graphical programming 2nd edition: Gray Johanson; TMH

## EIC-412 C Micro Sensors

| L T P Cr | |
|---|---|
| 4 0 0 4 | |

**Theory : 60 Marks**
**Class work : 40 Marks**
**Total : 100 Marks**
**Duration of Exam : 3 Hrs.**

**MEMS Technology:** Introduction Nanotechnology and MEMS, MEMS design and fabrication technology, Lithography, Etching, MEMS material, Bulk micromachining, Surface micromachining, Microactuator, Electrostatic actuation , Microfluidics.

**MEMS types and their applications:** Mechanical MEMS: Strain and pressure sensors, Accelerometers etc., Electromagnetic MEMS – Micromotors, Wireless and GPS MEMS etc.

**Magnetic MEMS**: Hall effect sensors, SQUID magnetometers, Optical MEMS: Micromachined fiber optic component, Optical sensors, Thermal MEMS: Thermomechanical and thermo−electrical actuators, Peltier heat pumps.

**Bio MEMS:** Introduction to BioMEMS, Introduction to Cell Electrophysiology, Silicon Microfabrication, Microfluidics and BioMEMS applications. MEMS for Drug delivery.

### Recommended Books


1. Gardner, J. W., Microsensors, Principles and Applications, John Wiley (2008).
2. Gregory T. Korvacs, Micromachined Transducer sourcebook, McGraw Hill (1998).
3. Turner, A.P.F., and Wilson, G.S., Biosensors−Fundamentals and applications, Oxford University Press (2005).
4. William T., Micromechanics and MEMS, IEEE Press (1997).

**EIC-412 D** **Adaptive Control**

| **L T P Cr** | **Theory : 60 Marks** |
|---|---|
| **4 0 0 4** | **Class work : 40 Marks** |
| | **Total : 100 Marks** |
| | **Duration of Exam : 3 Hrs.** |

UNIT1 INTRODUCTION
Adaptive schemes, adaptive control theory, adaptive control problem
UNIT2 REAL TIME PARAMETER ESTIMATION
Introduction, least square &regression model, estimating parameters in dynamical system ,experimental conditions ,properties of recursive estimators, implementation issues
UNIT 3 MODEL REFERENCE ADAPTIVR SYSTEM
Introduction The MRAS problem ,The gradient approach, MRAS based on stability theory ,direct MRAS for general linear system ,MRAS for partially known system
UNIT 4 SELF TUNING REGULATION
The basic idea, Indirect Self Tuning Regulators, Direct self tuning regulators ,unification of self tuning regulators, linear quadratic STRs, adaptive predictive control
UNIT5 STABILITY, CONVERGENCE &ROBUSTNESS
Introduction global stability, convergence, averaging, robustness, stochastic averaging, parameterization, instability mechanism, universal stabilizers
UNIT6 STOCHASTIC ADAPTIVE CONTROL
Introduction, problem formulation, dual control, suboptimal strategies
UNIT6 AUTO TUNING
Introduction, PID control, transient response methods, methods based on relay feedback
TEXT BOOK:
Adaptive control: Kail Johan Astron &Bjorn Witten marks: Westley Publishing Company
REFERENCE BOOK:
Adaptive control: Shankar Sastry &Marc Bodson:PHI

## E-416 Digital Signal Processing Lab

| L T P Cr | | |
|---|---|---|
| 0 0 2 1 | **Internal Marks** | **: 30 Marks** |
| | **External Marks** | **: 20 Marks** |
| | **Total** | **: 50 Marks** |
| | **Duration of Exam** | **: 3 Hrs.** |

LIST OF EXPERIMENTS:

Perform the experiments using MATLAB:

1. To represent basic signals (Unit step, unit impulse, ramp, exponential, sine and cosine).
2. To develop program for discrete convolution.
3. To develop program for discrete correlation.
4. To understand stability test.
5. To understand sampling theorem.
6. To design analog filter(low-pass, high pass, band-pass, band-stop).
7. To design digital IIR filters(low-pass, high pass, band-pass, band-stop).
8. To design FIR filters using windows technique.
9. To design a program to compare direct realization values of IIR digital filter
10. To develop a program for computing parallel realization values of IIR digital filter.
11. To develop a program for computing cascade realization values of IIR digital filter
12. To develop a program for computing inverse Z-transform of a rational transfer function.]

NOTE: At least ten experiments have to be performed in the semester; out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution.