

## DISTANCE EDUCATION PROGRAMME IN ENGINEERING ( EEE )

### IV<sup>th</sup> Year

Subject code	Subject	Type of Course	Internal Marks	External Marks	Total Marks	Duration of University Exam.
DMEEE401	Power system Operation & Control	Theory	25	75	100	3 hrs
DMEEE402	Applied Electronics & Instrumentation	Theory	25	75	100	3 hrs
DMEEE403	Electrical Drives & Traction	Theory	25	75	100	3 hrs
DMEEE404	Elective	Theory	25	75	100	3 hrs
DMEEE405 **	Engineering Economics & Management	Theory	25	75	100	3 hrs
DMEEE406 **	Fundamentals of Environmental engineering	Theory	25	75	100	3 hrs
DMEEE407	Power Electronics Lab <sup>α</sup>	Practical	50	50	100	3 hrs
DMEEE408	Control systems Lab <sup>α</sup>	Practical	50	50	100	3 hrs
DMEEE409	Project Work	Project	100	100	200	3 hrs
TOTAL MARKS					1000	

\*\* Common with other branches

### LIST OF ELECTIVES

Subject code	Subject	Subject code	Subject
DMEEE404-A	Digital Signal Processing	DMEEE404-E	Data Structures & Problem Solving
DMEEE404-B	Microprocessor Interfacing Techniques	DMEEE404-F	General Theory of A/C Machines
DMEEE404-C	Operations Research	DMEEE404-G	Digital Control Systems
DMEEE404-D	Control Instrumentation	---	---

<sup>α</sup> Denotes Courses for which 75% attendance at Contact Programme is compulsory

## **DMEEE-401: Power System Operation &Control**

**Unit –I Economic Operation of Power Systems:** Distribution of loads between units within a plant, Transmission loss as a function of plant generations, Calculation of loss coefficients, Distribution of load between plants, Penalty factors, Automatic load dispatching.

**Unit – II Components of a power system :** Power, Reactive Power and voltage relationships in simple systems ; Synchronous machines and its equivalent circuit under symmetrical fault condition ; Generators in parallel ; Operation of Generator into an infinite bus ; Salient pole Generators Loads and their voltage characteristics.

**Unit – III Control of power and frequency:** The turbine governor; control loops; division of load between generators; the power – frequency characteristics of an interconnected system; system connected by lines of relatively small capacity; phase – shift transformers; optimization of power system operation: computer control of load and frequency.

**Unit – IV Control of voltage and reactive power :** The Generation and absorption of reactive power; Relationship between voltage; power and reactive power at a note; methods of voltage control; Injection of reactive power; use of tap – changing transformers and a combination of both, Booster transformers; voltage stability and voltage control in distribution networks.

**Unit – V Power System protection, of Generation of over voltages, protection against over voltages, insulation co – ordination, propagation of surges; Determination of system voltages produced by traveling surges. Switch gear, qualities required of protection, components of protective schemes, protection systems, distance protection, unit protection schemes, Generator, transformer, feeder and bus bar protection.**

### **Textbooks :**

1. Electric Power Systems by B.M. Weedy, John Willey & Sons.
2. Elements of Power system Analysis by William D. Stevenson, TMH Publications.
3. Electric Power Systems by C.L. Wadhwa , New Age International Publications.

## **DMEEE-402: Applied Electronics and Instrumentation**

**Unit – I : Introduction to Operational Amplifiers:** Bread boarding, power supplies, reference voltages: Op. Amp terminals, parameters, characteristics: Frequency response Open-loop configurations - The differential, Inverting and Non-inverting.

Comparators: Introduction, Basic comparator, effect of noise: Zero-crossing detectors and level detectors – without and with hysteresis: Independently adjustable set point controller, precision comparator, window detector.

**Unit – II: Inverting, Non-inverting, Differential Amplifiers:** Closed loop voltage gain, input resistance, output resistance bandwidth: Differential amplifier schemes with one, two and three Op.Amps: Practical Op.Amp characteristics. Compensation procedures for input offset voltage, input offset current and input bias current: Completely compensated amplifier schemes: Summing, Scaling and Averaging amplifiers, Differential input and differential output amplifier.

**Unit – III: Differential, Instrumentation and Bridge Amplifiers:** Introduction, improvements to the basic differential amplifiers: Basic bridge amplifiers without and with grounded transducers: Instrumentation amplifiers – measurements of temperature, Flow, Weight, Light intensity.

**Selected Application of Op. Amps:** Voltage to current conversion – floating loads, grounded loads: current to voltage conversion: Low voltage D.C. and A.C. voltmeters: DC coupled and AC coupled voltage followers: The Integrator, the differentiator.

**Unit – IV : Active Filters:** Introduction, Low pass and High pass filters – Butterworth first and second order type: Band pass filters – Wide and narrow: Band reject filters – wide and narrow: Design considerations, Applications.

Wave Generators: Square wave generators, Triangular wave generators, Saw tooth wave generators.

**Oscillators:** Oscillator principles, phase shift oscillator, Wein bridge oscillator, applications.

**Unit – V: Integrated circuit (IC) Applications:** The 555 Timer – Introduction, Functional block-diagram, Monostable operation, Astable operation, applications. Voltage Regulators – General, Fixed voltage regulator, Adjustable voltage regulator. Counter Timers-Introduction. The XR 2240 programmable Timer/counter, applications.

### **Reference Books:**

1. 'OP' Amps & Linear Integrated circuits' by Ramakant A. Gayak Wad, PHI Publications.
2. 'Operational Amplifiers & Integrated circuits' Robert F. Coughlin, Frederick F. Drisscoll, PHI Publications.

## **DMEEE –403: Electrical Drives and Traction**

**Unit–I: Characteristics of Motors:** Basic relations & characteristics, modified speed-torque characteristics of D.C. shunt and series motors, characteristics of 3-phase induction motor and synchronous motor.

**Unit – II: Starting:** Effect of Starting on power supply, motor and load, Methods of starting Electric motors, Acceleration time, Energy Relations during starting and methods to reduce energy loss during starting.

**Unit – III: Electric Braking:** Types of braking, Braking of D.C. motors during lowering of loads, braking while stopping, Electric braking of induction motors and synchronous motors, Energy relations during braking.

**Unit – IV: Rating and Heating of Motors and Applications of Electric Drive:** Concept of Electric Drive and classification, heating effects, loading conditions and classes of duty, determination of power ratings of electric motors for different applications, Effect of Load inertia, load equalization and flywheel calculations, environmental factors, General factory drive, paper mill drive and Electric ship propulsion.

**Unit–V: Electric Traction:** General features and systems of tract electrification & traction motors. Characteristics and control of Locomotives/series parallel control. Motor coaches for tract electrification. Track equipment and Collector gear. Train movement: Speed distance and speed time curve and specific energy consumption.

### **Text Books:**

1. A First course on Electric Drives by S.K. Pillai, Willey Eastern Ltd.
2. Utilization of Electric Energy (in SI Units) by E. Open Shaw Taylor and VVL Rao, Orient Long., Bombay.

## **DMEEE- 404-A: Digital Signal Processing (Elective)**

### **Unit-I DISCRETE - TIME SIGNALS AND SYSTEMS:**

DISCRETE - TIME SIGNALS – SEQUENCES, LINEAR SHIFT – INVARIANT SYSTEMS, STABILITY AND CASUALITY, LINEAR CONSTANTS – COEFFICIENT DIFFERENCE EQUATIONS, FREQUENCY DOMAIN REPRESENTATION OF DISCRETE – TIME SIGNALS AND SYSTEMS.

### **Unit-II APPLICATIONS OF Z – TRANSFORMS:**

SYSTEM FUNCTIONS  $H(Z)$  OF DIGITAL SYSTEMS, STABILITY ANALYSIS, STRUCTURE AND REALIZATION OF DIGITAL FILTERS, FINITE WORD LENGTH EFFECTS.

### **Unit –III DISCRETE FOURIER TRANSFORM (DFT):**

PROPERTIES OF THE DFS, DFS REPRESENTATION OF PERIODIC SEQUENCES, PROPERTIES OF DFT, CONVOLUTION OF SEQUENCES.

### **FAST – FOURIER TRANSFORMS (FFT):**

RADIX – 2 DECIMATION – IN – TIME (DIT) AND DECIMATION – IN – FREQUENCY (DIF), FFT ALGORITHMS, INVERSE FFT.

### **Unit-IV IIR DIGITAL FILTER DESIGN TECHNIQUES:**

DESIGN OF IIR FILTERS FROM ANALOG FILTERS, ANALOG FILTERS APPROXIMATIONS ( BUTTERWORTH AND CHEBYSHEV APPROXIMATIONS), FREQUENCY TRANSFORMATIONS, GENERAL CONSIDERATIONS IN DIGITAL FILTER DESIGN, BILINEAR TRANSFORMATION METHOD, STEP AND IMPULSE INVARIANCE TECHNIQUE.

### **Unit-V DESIGN OF IIR FILTERS: FOURIER SERIES METHOD, WINDOW FUNCTION TECHNIQUES, COMPARISON OF IIR AND FIR FILTERS.**

#### **APPLICATIONS:**

APPLICATIONS OF FFT IN SPECTRUM ANALYSIS AND FILTERING, APPLICATION OF DSP IN SPEECH PROCESSING.

### **TEXT BOOKS:**

ALAN V. OPPENHEIM & RONALD W. SCHAFER: DIGITAL SIGNAL PROCESSING, PEARSON EDUCATION.

### **REFERENCES:**

1. SANJIT K. MITRA, DIGITAL SIGNAL PROCESSING “A – COMPUTER BASED APPROACH”, TATA MC GRAW HILL.
2. RADDAAE & RABINER, APPLICATION OF DIGITAL SIGNAL PROCESSING.
3. S. P. EUGENE XAVIER, SIGNALS, SYSTEMS AND SIGNAL PROCESSING, S. CHAND & CO. LTD.
4. ANTONIO, ANALYSIS AND DESIGN OF DIGITAL FILTERS, TATA MC GRAW HILL.

## **DMEEE-404-B: Microprocessor interfacing Techniques (Elective)**

**Unit – I:** Chapters 3 and 5 of Text Book –1. The 8085 CPU. Memory addressing. I/O Addressing

**Unit– II:** Chapt.6,7 of Text Book–1. 8085 A Minimum System Configuration,EPROM:2764  
RAM: 6264

**Unit – III:** Chapt.8,9 of Text Book–1. Programmable keyboard / display interface: 8279  
Programmable interval Timer: 8253

**Unit – IV:** Chapt.10,11 of Text Book – 1. Programmable peripheral interface: 8255  
Serial communication and USART: 8251

**Unit–V:**Chapt.12 and 13 of Text Books – 1. Programmable DMA controller:  
8257,Programmable Interrupt Controller: 8259

### **Text Books:**

1) : 0000 to 8085: Introduction to Microprocessors for Engineers and Scientists by P.K. Ghosh and PR Sridhar PHI edition.

2) Microprocessor Architecture, Programming and application with 8085 / 8080 A by Ramesh, S. Goankar Wiley Eastern Ltd.

## DMEEE- 404-C: Operation Research ( Elective )

**Unit\_I: Linear Programming):** Introduction, Requirements for a LP problem ,Examples on the application of LP, Graphical solution of two-variable LP problems, some exceptional cases, general mathematical formulation for LP, Canonical& standard forms of LP problem, simplex method, examples on the application of simplex technique .Artificial variable technique: Big-M-method& two-phase technique.

**Unit – II:** Unconstrained variables, Degeneracy in simplex methods, duality in linear programming.

Revised simplex method: Computational procedure, examples on the application of Revised simplex method, Advantages over simplex method.

**Unit – III: Transportation Model:** Matrix terminology, definition and mathematical representation of transportation model, formulation and solution of transportation models. (Basic feasible solution by North-West Corner Method, inspection method Vogel's approximation Method).

Assignment Model: Matrix terminology, Definition of Assignment Model, comparison with Transportation model, Mathematical representation of assignment model formulation and solution of Assignment models, variations of the Assignment problem.

**Unit – IV :Pert and CPM:** Introduction, phases of project scheduling, Network Logic, Numbering the events (Fulkerson's rule) measure of activity, Frequency of Distribution curve for PERT, PERT Computations: Forward backward pass computations, slack, critical path, probability of meeting the scheduled dates. CPM Computations: How CPM differs from PERT, CPM terms, critical path float.

**Inventory Model:** Introduction, necessity for maintaining inventory, classification of inventory models, inventory models with deterministic demand: Demand Rate uniform, production rate infinite, Demand rate non-uniform, production rate finite, demand rate uniform production rate finite.

**Unit – V:** Introduction, characteristics of queuing models, Waiting time and Idle time costs, single channel queuing theory. **Game Theory:** Useful terminology, Rules of Game Theory, Saddle point, pure strategy, Reduce game by dominance, Mixed strategies 2x2 games without Saddle point.

### **Text Books:**

1)\_Operations Research – An Introduction by H.A.TAHA PHI Pvt. Ltd.

2).Operations Research–An Introduction by P.K.Gupta and D.S.Hira .S.Chand&Co. Ltd., N.D-55.

## **DMEEE- 404-D : Control Instrumentation (Elective )**

**Unit – I: Classification of Transducers:** Electrical Transducer classification – Basic requirements of a transducer. Performance characteristics of an Instrumentation system: Generalized measurements, zero-order system, First-order system, second-order system, Dead-time element, specification and testing of Dynamic response.

**Unit – II: Displacement:** Principles of Transduction – variable resistance Device - variable Inductance Transducer – Induction Potentiometers – Synchros – Revolvers.

**Unit – III: Strain:** Types of strain gauges, theory of operation of resistance strain gauges, Electrical strain gauges, Wire gauge, semi-conductor strain gauge, strain gauge circuits – Wheat stone bridge circuit, strain gauge balancing circuit, temperature compensation through Bridge arrangement applications.

**Unit – IV: Pressure and Flow:** Different types of Diaphragms, transduction methods, strain gauge transducers – Variable reluctance sensor – LVDT type transducers, Variable capacitance device, Force balance transducer and their analysis. Various types of Flow meters.

**Unit – V: Temperature:** Resistance type temperature sensors, platinum Resistance thermometer, Resistance thermometer circuits.

Force and Torque: Forcing measuring sensor, Load-cell temperature compensation for young's Modulus variations, Dynamic response of elastic transducers.

### **Text Books:**

Instrumentation Devices and Systems by C.S. Rangan ,G.R. Sarma and V.S.V. Mani. TMGH Pub. Co.,1983.

**DMEEE- 404-E : Data Structures and Problem Solving ( Elective )**

Prerequisite: Chapter 1 and 2 (not to be examined).Introduction and overview Preliminaries.

**Unit – I:** Chapter 4 and 9.Arrays, Records and Printer arrays.

**Unit – II:** Chapter 5: Linked Lists

**Unit – III:** Chapter 6 : Stacks, Queues, Recursion

**Unit – IV:** Chapter 7: Trees.

**Unit – V:** Chapter 3 : String Processing

**Text Book:**

Theory and Problems of Data Structures by Seymour Lipschutz , Schaum's Series, MGH.

**Reference:**

How to solve it by Computer by R.G. Dromey, PHI Publications.

## DMEEE 404- F : General theory of A.C. Machines-I ( Elective )

**Unit – I: The basis of the general machines theory:** The idealized machines the two winding transformer, explanation of sign conventions, magneto motive force and flux in rotating machine, voltage and torque equations, the per unit system for mechanical quantities the fundamental assumptions: saturation, harmonics and leakage, calculation and measurement of parameters.

**Unit – II: The primitive machine:** The equations of the cross field commutator machine, application to a simple do machines, equations for small changes and small oscillations, sudden short-circuit of a do generator.

**Unit – III: The general equations of ac machines:** Equation in terms of phase-variables, transformations between various reference frames, direct derivation of two-axis equations, simplified equations of a synchronous machine with two damper coils, equivalent circuits operational impedance, and frequency response loci, general equations of the induction motor.

**Unit – IV :Types of Problems and methods of solution for machines:** Classification of problems and methods of solution, modified machine equations in terms of rotor angle-d, the state variable methods and the state space concept, calculation of system response and stability, optimization, performance indices.

**Unit – V: Synchronous generator short-circuit:** Symmetrical short-circuit of an unloaded synchronous generator the analysis of short-circuit oscillograms.

Effects of saturation and eddy currents on machine performance.

Methods of allowing for saturation, effect of eddy currents in the magnetic materials, effect of eddy current in conductors.

### Text Book:

The general Theory and Alternating current machines, B. Atkins and Ronald Harley, Chapman and Hall, London, 1975.

## **DMEEE- 404- G: Digital Control Systems (Elective)**

**Unit-I:** Advantages of sampling process in Control Systems, mathematical analysis of the sampling process, Mathematical description of the ideal sampling process. The ideal sampler, sampling theorem, some S-Plane properties of  $F^*(S)$ , Reconstruction of sampled signals, zero-order hold, First-order hold, fractional order hold and exponential hold devices.

**Unit – II:** Definition of the Z-transform, Evaluation of the Z-transform, Mapping between S-plane and Z-plane, Inverse Z-transform, Theorems of the Z-transform, Limitations of the Z-transform, pulse-transfer function, pulse transfer function of the zero-order hold.

**Unit-III:** Stability tests of the Digital control systems, JURY's stability tests, extension of Routh-Hurwitz criterion to Digital Control Systems, Root Locus for Digital Control Systems.

**Unit-IV:** State equations of digital systems, state transition equations of digital systems, solution of the time-invariant Discrete State Equations by the Z-transformations, Relation between state equation and transfer function, computing the state transition matrix by the Z-transform method, Relation between state equations and high order difference equations via canonical form, Analysis of the state diagrams of the SDCS.

**Unit-V:** The digital control realization of the digital controller by digital networks, and digital computers, design of digital Control Systems through the bilinear transformation. The digital PID controller, Design of Digital Control System with Dead beat response.

### **Text Book:**

Digital Control Systems-B. C. Kuo, Hold-Saunders International Edn.(1980).

### **Ref.Books:**

1. Digital .Control. and. State. Variable .Methods- M. Gopal, .TMH.Pub.Co.Ltd. ND(1997).
2. Digital Control Systems- C. H . Houpis and G.B. Lamount. MGH Co.(1985).

**DMEEE-405: Engineering Economics and Management**  
(Common with ECE and Chemical branches)

**Unit - 1**

Fundamentals of Economics: Wealth and Welfare Definitions, Robbins' Scarcity Definition; Micro and Macro Economics; Nature of Economics –Economics as a social science, Laws of Economics, Assumptions in Economics; Mixed Economies; Basic elements of Supply and Demand –Elasticity of Demand and its cases and types, Factors determining price elasticity of Demand.

**Unit – 2**

Industrial Policy of the Government, New Industrial Policy-1991; Forms of Business Ownership – Private, Public, and Joint Sector Management; Capital Requirement and Methods of Financing Industry; Cost Concepts – Elements of Costs.

**Unit – 3**

Evolution of Management Thought (schools of thought); Principles and Functions of Management; Forms of Organization; Decision Making Process; Production Planning and Control.

**Unit - 4**

Plant Location and Plant Layout; Materials Management; Purchasing Organizations; Inventory Control and ABC Selective Control Policy; Break – even Analysis.

**Unit – 5**

Leadership – Characteristics, Formal and Informal leaders and responsibilities and qualities of leadership; Motivation – Characteristics, importance, and kinds of motivation; Communication –Nature, Process, forms, and steps for making communication effective; wages and Methods of wage payment; Industrial Disputes and their Settlement; Provisions of Factories Act.

**Text Books:**

1. Sharma, S.C. & Banga, T.R., - Industrial Organization & Engineering Economics
2. Dewett, K.K. – Modern Economic Theory

**References:**

- |                   |                                 |
|-------------------|---------------------------------|
| 1. Dwivedi, D.N., | Managerial Economics            |
| 2. Goal, B.S.,    | Production Operation Management |
| 3. Tara Chand     | Engineering Economics           |
| 4. Allen, L.A.    | Management and Organization     |

## **DMEEE 406 : Fundamentals of Environmental Engineering**

**(Common with ECE, Mechanical)**

### **Unit – 1**

#### **Module 1 : Introduction**

Definition, score and importance, measuring and defining environmental development: indicators

#### **Module 2 : Ecosystems**

Introduction, types, characteristic features, structure and functions of Ecosystems, forest, grassland, desert, aquatic (lakes, rivers, and estuaries)

### **Unit – 2**

#### **Module 3 : Environment and Natural Resources Management**

Land resources : land as a resource, common property resources, land degradation, solerosion and desertification, effects of modern agriculture, fertilizer-pesticide problems, Forest resources : use and over-exploitation, mining and dams – their effects on forest and tribal people, Water resources : use and over-utilization of surface and ground water, floods, droughts, water logging and salinity, dams – benefits and costs, conflicts over water, Energy resources : Energy needs, renewable and non-renewable energy sources, use of alternate energy sources, impact of energy use on environment

### **Unit – 3**

#### **Module 4 : Bio-diversity and its Conservation**

Value of bio-diversity – consumptive and productive use, social, ethical, aesthetic and option values, bio-geographical classification of India – India as a mega diversity habitat, Threats to biodiversity – Hot-spots, habitat loss, poaching of wildlife, loss of species, seeds etc., Conservation of bio-diversity – in-situ and ex-situ conservation.

#### **Module 5 : Environmental Pollution – Local and Global Issues**

Causes, effects and control measures of : air pollution, indoor air pollution, water pollution, soil pollution, marine pollution, noise pollution, solid waste management, composting, vermiculture, urban and industrial wastes, recycling and re-use, Nature of thermal pollution and nuclear hazards, Global Warming, Acid Rain, Ozone depletion

### **Unit – 4**

#### **Module 6 : Environmental Problems in India**

Drinking water, sanitation and public health, Effects of activities on the quality of environment : urbanization, transportation, industrialization, green revolution, Water scarcity and ground water depletion, Controversies on major dams – resettlement and rehabilitation of people problems and concerns, Rain water harvesting, cloud seeding and watershed management

**Module 7 : Economy and Environment**

The economy and environment interaction, Economics of development, preservation and conservation, sustainability : theory and practice, Limits to growth, Equitable use of resources for sustainable lifestyles, Environmental impact assessment

**Module 8 : Social Issues and the Environment**

Population growth and environment, environmental education, Environmental movements, Environment Vs development

**Unit – 5****Module 9 : Institutions and Governance**

Regulation by Government, Monitoring and enforcement of environmental regulation, environmental acts : water (Prevention and control of pollution) act, air (prevention and control of pollution) act, Env't. Protection act, wild life protection act, forest conservation act, coastal zone regulations, Institutions and policies relating to India, Environmental Governance.

**Module 10 : International Conventions**

Stockholm conference 1972, Earth summit 1992, World commission for environmental development (WCED).

**Module 11 : Case Studies**

Chipko movement, Narmada Bachao andolan, Silent valley project, Madhura Refinery and Taj Mahal, Industrialization of Pattancheru, Nuclear reactor at Nagarjuna Sagar, Tehri Dam, Ralegaon Siddhi (Anna Hazare), Kolleru lake – aquaculture, Florosis in Andhra Pradesh.

**Module 12 : Field Work**

Visit to a local area to document and mapping environmental assets – river/forest/grass land/hill/mountain, Study of local environment – common plants, insects, birds, Study of simple ecosystems – pond, river, hill, slopes etc., Visits to industries, water treatment plants, affluent treatment plants.

**Textbook :** Kaushik – Kaushik, Anubha

**Reference :** Deswal & Deswal, Raja Gopal, Dharmaraj Publishers,

### **DMEEE-407: Power Electronics Laboratory**

List of Experiments:

Expt.No.	Name of the Experiment
1.	Single phase half controlled bridge converter
2.	Single phase full controlled bridge rectifier
3.	Single phase AC controller using Triac
4.	Commutation circuits of SCR
5.	D.C.Jones Chopper
6.	Single Phase cycloconverter
7.	Single phase dual converter
8.	Single phase series inverter
9.	Single phase parallel inverter
10.	R & RC Triggering Circuits
11.	UJT Relaxation oscillator
12.	Static characteristics of a Triac

### **DMEEE-408: Control Systems Laboratory**

List of Experiments:

Expt.No.	Name of the Experiment
<b>1.</b>	<b>Seriesly connected magnetic amplifier</b>
2.	Armature controlled D.C.Servomotor
3.	Synchropair
4.	Parallely connected magnetic amplifier
5.	Field controlled D.C.Servomotor
6.	A.C.Servomotor
7.	D.C.Position control system
8.	Compensating Networks
9.	magnetic amplifier with feed back
10.	Stepper motor
11.	Amplistat connected magnetic amplifier

### **DMEEE-409: Project Work**