SYLLABUS

DISTANCE EDUCATION PROGRAMME IN ENGINEERING

ELECTRICAL & ELECTRONICS ENGINEERING

III[rd] Year

Subject code	Subject	Type of Course	Internal Marks	External Marks	Total Marks	Duration of University Exam.
DMEEE 301	Performance & Design of Electrical Machines - II	Theory	25	75	100	3 hrs
DMEEE 302	Digital electronics	Theory	25	75	100	3 hrs
DMEEE 303	Control System	Theory	25	75	100	3 hrs
DMEEE 304	Computers & Microprocessors	Theory	25	75	100	3 hrs
DMEEE 305	Electromagnetic Field Theory	Theory	25	75	100	3 hrs
DMEEE 306	Power System analysis & Stability	Theory	25	75	100	3 hrs
DMEEE 307	Power electronics	Theory	25	75	100	3 hrs
DMEEE 308	Electrical Machines Lab[α]	Practical	50	50	100	3 hrs
DMEEE 309	Thermal Prime Movers Lab[α]	Practical	50	50	100	3 hrs
DMEEE 310	Electronics – II Lab[α]	Practical	50	50	100	3 hrs
				TOTAL MARKS	1000	

[α] Denotes Courses for which 75% attendance at Contact Programme is compulsory.

SYLLABUS

SCHOOL OF DISTANCE EDUCATION

ANDHRA UNIVERSITY, VISAKHAPATNAM.

B.E./B.TECH. – ELECTRICAL AND ELECTRONICS ENGINEERING

IIIrd Year

DMEEE-301:PERFORMANCE AND DESIGN OF MACHINES – II

Unit - I:

3–Phase Induction Machines: Principle of operation – Production of Rotating Magnetic Field. Types of rotors. Torque expression. Vector diagram, slip-torque characteristics. Effects of change in supply voltage and supply frequency on torque and speed-torque, Mechanical power and rotor output–Synchronous Watt. Equivalent circuit and calculations based on equivalent circuit, Maximum Torque and Maximum power output conditions. Circle diagram and computation from circle diagram.

Unit - II:

Starting of induction motors: Crawling and Cogging of squirrel cage induction motors. Squirrel cage induction motor and equivalent circuit. Introduction to the Methods of speed control of induction motor. Induction generator–Principle of operation.

Single phase induction Motors: Types–Double revolving field theory, Equivalent circuit (without core losses and with core losses considered) and performance analysis and characteristics of Capacitor–start motor. Shaded pole motor. Repulsion type motor. AC series motor. Reluctance motor and Hysterisis motor.

Unit - III:

Synchronous-Generators: Basis concepts, types of machines and

Construction, Armature windings e.m.f. equation, effect of chording and winding distribution, Armature reaction, Regulation by Synchronous impedance, M.M.F. and Potier triangle methods, Operation on infinite-bus, power-flow equations, capability curve of synchronous generator, salient pole machine and two-reaction model, power angle characteristics.

Determination of x_d and x_q by slip test in synchronous machines– parallel operation of Synchronous generators. Short circuit transient in synchronous machine.

Unit - IV:

Synchronous Motors: Principle of operation, Methods of starting power flow and power developed by synchronous motors. Effects of increased load with constant excitation and changing excitation at constant load. Excitation and power circles, V and Inverted V curves, Hunting in synchronous Machines and Damper windings.

Unit–V: Design: Output equation for three phase synchronous and induction machines – Main dimensions–Armature windings–Selection of stator and rotor slots.

Text Books:

1. Performance and Design of Alternating current Machinery by M.G. Say, ELBS Edition

2. Electric Machines by I.J. Nagrath and D.P. Kothari.

DMEEE-302: DIGITAL ELECTRONICS

Unit-I:

Number Systems: (Review of Principles and methods, No examination questions from this topic). Number representation, conversion of bases, the binary and the decimal system, the BCD,

Octal, Hexadecimal. Number excess-3 code, Gray code and the ASSCII code. Boolen Algebra; Switching algebras. Basic properties, switching expressions-their manipulation, De-morgans theorems, switching, functions, canonical forms, boolean algebra, relation between boolean algebra and switching algebra, simplification. Logic circuits: Functions of single and two-binary variables, The OR, NOR, NAND and EXCLUSIVE-OR operation synthesis using NAND- OR -NOR gates.

UNIT-II:

Minimization of switching functions. The Karnaugh - map method, Minimal functions and their properties, tabulation procedure for the determination of prime implicants, The-prime imp1icant chart Don't care combinations. Reduction of the chart

UNIT-III:

Gate circuits: DTL, HTL and their characteristics .Complete characteristics of all types of TTL gates. schottky TTL, TTL output circuits. Inverter output stage. Totem-pole output, Emitter-follower output, ttl gates with open collector, Wired logics.

CMOS: CMOS NAND, NOR, and Inverter circuits, CMOS characteristics.

ECL: The ECL gate, OR, NOR and NAND gates, in respect of Transfer characteristics. Characteristics in respect of speed and temperature level translation.

UNIT - IV:

(a) Flip Flops: study and applications of truth tables, f1ipflops. circuits and applications of the following Flipflops.

i) SOR FFOs, c1ocked and Master slave types

ii) JK FFs, clocked and Master-slaves FFs

iii) D-type FFs

iv) TFFs.

Flip Flop specifications, study of standard TTL flip flops

(b) Registers: The shift register, clocking, data transfer in all the four modes of input-output combinations. Shift right shift-lest register. Study of standard TTL 1C's**.**

(c) Counters: Ripple counters, non-binary counters, Methods improve counter speed, decoding. Designing non-binary counters, other counter designs. Synchronous counters with ripple carry and parallel carry. The Up-Down ripple and synchronous counters, ring counters, and sequence generates.

UNIT-V:

(a) Arithmetic Operations: The basic addition operation in binary and BCD systems. Addition of two binary numbers, the full adder, the serial adder, parallel adders, BDC adders, addition of more than two numbers. Fast adders, look ahead carry adders. Subtraction-complementary numbers, representation of signed numbers binary and BCD subtractions, Scalling, Multiplication, Division, the arithmetic Logic Unit (ALU), Study of TTL adder ICs and ALU Ics (b) Semiconductor memories: Memory concepts, types of memories, reading and writing, the ROM, Programmable and Erasable ROMs, Bipolar and MOS RAMS, Organisation of a RAM, paralleling-of-semiconductor-memory-integrated-circuit chips. (c) Multiplexers, demultip1e-xers, Decoders, Multiplexer logic keyboard decoding study of74153, 157,150,155,154,TTL ICs.

Text Books:

1. Digital Integrated Electronics by Herbert Taub, Donald Schilling, MGH-1977.

2. Switching and Finite Automata Theory by sor Kohavi, TMGH, 2nd Edn

References:

1. Digital Computer Fundamenz-als by Thomas C. Bartee, MGH Internal.

2. **Wave** generation and shaping by Leonard strauss, TMHill 2nd edn.

3. Practical Digital Design Using ICs by Joseph D. Greenfield, John wiley & Sons, 2nd edn.

DMEEE 303-CONTROL SYSTEMS ENGINEERING

Unit - I:

Historical development of Automatic control as Introduction (No questions to set on this). Mathematical Models of Physical Systems – Transfer functions of Linear systems – Impulse response of linear systems – Block diagrams and Signal flow graphs (simple examples) – Reduction techniques for complex block diagrams and signal flow graphs (simple examples). Feedback characteristics of control systems.

Unit - II :

Control systems and component – A.C. and D.C. Servo motors – A.C.&D.C. Tachometers Synchros-Time response of first and second order systems with standard input signal. Effect of derivative and integral control of transient and steady state performance of feed-back control systems – Steady – state error constants. Type of control systems and order of system.

Unit – III:

Concept of stability – Necessary conditions for stability – Routh – Hurwitz criterion, Relative stability analysis. The concept and construction of Root-Loci. Analysis of control systems with root locus (simple problems to understand the theory).

Unit – IV:

Correlation between time and frequency responses. Polar plots, Bode plots, Nyquist stability citerion – Assessment of relative stability – compensation with load, lag networks using Bode plots techniques.

Unit – V:

State Variables analysis, concept of state, state variables and state models, state model for linear continuious time systems. Solution of state equaltions, state transition matrix. Concept of controllability and observbility (Simple problems to understand the theory).

Text Book:

Control Systems Engineering, I.J. Nagrath and M. Gopal, Wilsey Eastern Ltd.

References:

1) Automatic Control Systems, B.C. Kuo, Prentice Hall.

2) Modern Control Engineering: K'ogata, Prentice Hall.

3) Control System Components , J.E. Gibson and F.B. Tuteur, McGraw Hill.

DMEEE-304: COMPUTERS AND MICRO PROCESSORS

UNIT-I:

Computer organization : Memory Unit and Register Transfer logic**:** The memory element, Random access memories. Linear sleet organisation, decoders, connecting memory chips to computer bus, static random access memories, dynamic random access memories, read only memories, magnetic disk men-ic'rie, flexible storage systems, the floppu dik, magnetic tape, magnetic bubble and CCD memories, digital recording techniques, return to zero recording techniques. Inter

Register transfer, Arithmetic logic and shift micro operations, conditional control operations.

UNIT-II:

Processor And Control Logic Design: Processor organisation, Art thematic unit. Design& Arithmetic circuit, Design of logic circuit, Design & Arithmetic logic unit, Status register. Design of shifter, Processor unit. Design of Accumulator. Control organisation. Hardwired control. Microprogram control, Control of processor unit, PLA Control, Microprogram sequencer.

UNIT-III:

Microprocessors : 8085 Microprocessor Architecture And Programming: Microprocessor architecture and microcomputer systems, Instruction and timing's, Programming techniques with additional instructions. Counters and Timing delays, Stack and subroi-ine, Code conversion, BCD Arithematic and 16 bit data operations.

UNIT- IV:

Interfacting Peripherals(I/O's) and Applications:

Interrupts, Interfacing data converters, the 8279 programmable key board/ Display interface, the 8255A programmable peripheral Interface, the 8254(8253) programmable Interval timer , the 8259A programmable Interrupt Controller, the 8251A programmable communication Interface.

UNIT-V:

Elementary Concepts of 8086:8086 Architecture, Instruction et, simple programs

Text Books:

Part A: Digital Logic and Computer Design M. Morris Mano (PHI edition)

Part.B**:** Microprocessor Architecture, programming & applications by R.S. Gaonkar (Wiley Eastern)

Reference Books:

1. Digital Computer Fundamentals T.C.Bartee (Mc Graw Hill)

2. Introduction to Microprocessors by A.P Mathur (TMH edition 1988)

DMEEE-305: Electromagnetic Field Theory

UNIT-I:

Electrostatic Fields: Concept of Electric field—Field from Coulomb's law-field due to different charge d1stributions-Gaussss's 1aui in integral and differential form-concept of electric flu;< density-Gauss's law on arbitrary surfaces-Electric field in terms of potential gradient, arbitrary surfaces-Electric field in terms of potential

Gradient, Effect of electric field on point charge-Energy density in the Effect of Electric field on point charge-Energy density in the field-Electric fields in dielectric materials-Concept of Polarization.

UNIT-II:

Magneto static fields: Magnetic field-current element-biot-Savort Law-Ampere's Circuital law in integral and differential form-farce between current elements-Vector Magnetic Potential-Effect of magnetic field on moving charge-concept of magnetic flu& densty-Energy-density in magnetic field-fields in magnetic materials-concept of magnetization.

UNIT-III:

Electromagnetic Fields: The phasor representation of sinusoidally time-varying fields-Maxwells equations in both integral and differential form-Maxwells- equations for sinusoidally time varying fields-

displacement current density-Boundary conditions-pointing thermo and its concept and applications-Retarded potentials-Electro-magnetic fields in conductors and dielectrics-depth of penetration.

UNIT-IV:

Applied Electromagnetics: Poisson's and Laplace equations-Method of images-wave equations uniform plane waves-reflection by a perfect conductor-normal incidence - ef1ection by a perfect conductor-oblique incidence-ref lection by a perfect conductor-oblique incidence-perfect dielectric-normal incidence.

UNIT-V:

Guided Electromagnetic Waves: Waves between parallel planes, TE, TM and TEM waves-waves, in rectangular waveguides-tneir field equations- velocities of propagation-reciprocity in electromagnetic field theory-equivalence theorem-Reactive concept and applications-differences between field theory and circuit theory.

Text Books:

1. Engineering Electromagnetics by W.H Hayt, Jr, M GHl, New York.
2. Electromagnetic Waves and Radiating Systems by E.C. Jordan & K.G. Balmain, PHl, N D.

References.

1. Electrimagnetics by J.D. Draus, MGHl, NY
2. Electromagnetic Waves by R.G. Carter, Chapman & Hall.
3. Time-Harmonic Electromagnetic Fields by R.F. Harrington, MGH, NY

DMEEE –306: POWER SYSTEM ANALYSIS AND STABILITY

Unit – I :

Performance of medium and long transmission lines, Power circle diagrams, Single Line diagram, Per Unit quantities, P.U. Impedance of 3-winding transformers, P.U. impedance diagram of a Power System.

Unit – II:

Load Flow Analysis: Formulation of network matrices, Formulation of Y – Bus. Gauss Siedel method, Newton-Raphson method and Fast decoupled methods of solving load flow problems.

Unit – III:

Symmetrical Fault Analysis: 3 – Phase Short Circuit currents and Reactances of a Synchronous machine, Fault limiting reactors.

Symmetrical Components: The Symmetrical components, Phase shift in Delta/Star Transformers, 3-Ph power in terms of Symmetrical components.

Unit – IV:

Un-Symmetrical Fault Analysis: Various types of faults LG, LL, LLG on an unloaded alternator, Sequence Impedance and Sequence Networks, Analysis of different faults on a Power System.

Unit – V:

Power System Stability: Concepts of stability (Steady State and Transient), Swing equation, Equal area criterion, Critical Clearing angle and time for Transient Stability, Step by Step method of solution, Factors affecting Transient Stability.

Reference Books:

1. Power System Analysis – Hadi Sadat, Mc Graw Hill, 1999.
2. Elements of Power System Analysis, William D. Stevenson, Jr., Mc. Graw Hill.
3. Modern Power System Analysis–D.P. Kothari & I.J. Nagrath, TMG.

DMEEE –307: POWER ELECTRONICS

Unit – I:

Thyristors: Introduction, SCR characteristics, Principle of operation, transistor analogy. Methods of turn-on and turn-off gate characteristics. Thyristor ratings. Series and parallel operation of Thyristors. Thyristor protection circuits. U. J. T and Triac.

Unit – II:

Thyristor: Controlled Rectifiers: Half-wave, Full-wave, Bridge controlled circuits. Dual converters. Three-phase half-wave and full-wave controlled rectifiers.

Thyristor Voltage Choppers: On-off control, Morgan Chopper, Jones Chopper. Charging and commutation analysis.

Unit – III:

Inverters: Classification, commutation circuits, series and parallel inverters, self-commutated inverters. The McMurray Inverter, The McMurray – Bed Ford Inverter. Voltage proportional to frequency, variable voltage converter, Inverter voltage control. Harmonic elimination, current controlled inverter.

Cycloconverters: Mathematical analysis, Bridge configuration control circuit, improved cycloconverter circuits. Harmonic analysis, circulating current schemes.

Unit – IV: **Direct current Motor Control**: Starting D.C. Motor: Thyristor and the resistance starter, Thyristor starting without resistance. Speed control D.C Motor using 1 - ϕ half-wave, 1 - ϕ full wave, 1 - ϕ Bridge rectifier, 3 - ϕ half-wave, 3 - ϕ full wave rectifiers. Armature and field control using choppers. Thyristor position control.

Unit – V : Induction Motor Control: Starting of Induction Motor by Thristors. Speed control of induction motors by line commutated inverters. Inverters in the I.M. rotor circuit, slip-power recovery scheme.

Synchronous Motor Control: Starting of Synchronous by Thyristors. Speed control of Synchronous motors. A Thyristor stepping motor. A cycloconverter for low speeds. Synchronous motor excitation. Bushless Excitation protection during starting.

Text Books:

1. Thyristor controlled power for electric motor. By Raymond Ramshaw, ELBS, 1979

2. An Introduction to Thyristors and their application, by M. Rama Murthy, EWP Second Edition, 1991.

DMEEE-308: ELECTRICAL MACHINES-II LABORATORY

1) No load and load characteristics of a separately – excited d.c. shunt generator

2) No load and load characteristics of a self – excited d.c. shunt generator

3) Load characteristics of compound d.c. generator

4) Swinburne's Test

5) Hopkinson's Test

6) Open Circuit Test and Short Circuit Test on a 1 – Phase Transformer

7) Sumpner's Test on a 1 – Phase Transformer

8) No Load and Blocked Rotor Tests on a 3 – phase Slip ring Induction Motor

9) No Load and Blocked Rotor Tests on a 3 – phase Squirrel Cage Induction Motor

10) Load Test on a 3 – phase Slip ring Induction Motor

11) Load Test on a 3 – phase Squirrel Cage Induction Motor

12) Regulation of a 3 – Phase Alternator by Synchronous Impedance method

13) No Load and Blocked Rotor Tests on a 1 – phase Squirrel Cage Induction Motor

14) Cascade Operation of 3 – phase Slip ring Induction Motors

DMEEE-309: THERMAL PRIME MOVERS LABORATORY

Cycle-I: Study of 2-stroke and 4-stroke engine models and their major components.

1. Determine the volumetric efficiency of the given air compressor by using 1.Plate orifice method. 2. Tank capacity method.

2. Determination of kinematic viscosity and absolute viscosity of the oil sample using Redwood Viscometer-I.

3. Determination of kinematic viscosity and absolute viscosity of the oil sample using Redwood Viscometer-II.

4. Calibration of the given pressure gauge with deadweight pressure gauge tester.

5. Determination of Flash point and Firepoint using open cup tester for given transformer oil.

6. Load test on four-stroke diesel engine. (Kirlosker Engine)

7. Study and valve timing diagram for Ruston Engine.

8. Load test on electrically loaded I.C. engine.

9. Calibrate the given pressure gauge with dead weight calibrating unit.

10. Study of thermal prime movers like boilers, steam turbines, steam engines etc.

11. Determination of flash point of the given oil sample using closed cup tester.

12. Determination of calorific value of the given liquid fuel using Bomb calorimeter / or gas calorimeter.

DMEEE-310: ELECTRONICS -II LABORATORY

1. Feedback amplifier.

2. RC Phase shift oscillator.

3. Uien bridge oscillator.

4. Colpitts oscillator.

5. Operational amplifier as a inverting and non-inverting amplifier.

6. Measurement of Operational amplifier parameters.

7. Applications of Operational amplifier.

8. RC low pass and high pass circuits.
9. Clipping and Clamping circuits.
10. Collector coupled Astable multi
11. Monostable multi.
12. Bista.ble multi.
13. Schmitt trigger.
14. UJT sweep generation and measurement of errors.
15. Miller or bootstrap sweep generator.

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