# SYLLABUS

## DISTANCE EDUCATION PROGRAMME IN ENGINEERING

### ELECTRICAL & ELECTRONICS ENGINEERING

#### III<sup>rd</sup> Year

<table>
<thead>
<tr>
<th>Subject code</th>
<th>Subject</th>
<th>Type of Course</th>
<th>Internal Marks</th>
<th>External Marks</th>
<th>Total Marks</th>
<th>Duration of University Exam.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMEEE 301</td>
<td>Performance &amp; Design of Electrical Machines - II</td>
<td>Theory</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3 hrs</td>
</tr>
<tr>
<td>DMEEE 302</td>
<td>Digital electronics</td>
<td>Theory</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3 hrs</td>
</tr>
<tr>
<td>DMEEE 303</td>
<td>Control System</td>
<td>Theory</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3 hrs</td>
</tr>
<tr>
<td>DMEEE 304</td>
<td>Computers &amp; Microprocessors</td>
<td>Theory</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3 hrs</td>
</tr>
<tr>
<td>DMEEE 305</td>
<td>Electromagnetic Field Theory</td>
<td>Theory</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3 hrs</td>
</tr>
<tr>
<td>DMEEE 306</td>
<td>Power System analysis &amp; Stability</td>
<td>Theory</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3 hrs</td>
</tr>
<tr>
<td>DMEEE 307</td>
<td>Power electronics</td>
<td>Theory</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3 hrs</td>
</tr>
<tr>
<td>DME EE 308</td>
<td>Electrical Machines Lab&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Practical</td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>3 hrs</td>
</tr>
<tr>
<td>DMEEE 309</td>
<td>Thermal Prime Movers Lab&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Practical</td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>3 hrs</td>
</tr>
<tr>
<td>DME EE 310</td>
<td>Electronics – II Lab&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Practical</td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>3 hrs</td>
</tr>
</tbody>
</table>

**TOTAL MARKS** 1000

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


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


**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,

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 implicant 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, flipflops. circuits and applications of the following Flipflops.
i) SOR FFOs, clocked 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-left register. Study of standard TTL IC’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, demultiplexers, Decoders, Multiplexer logic keyboard decoding study of 74153, 157,150,155,154,TTL ICs.

Text Books:


2. Switching and Finite Automata Theory by sor Kohavi, TMGH, 2nd Edn
References:
2. Wave generation and shaping by Leonard strauss, TMHill 2nd edn.

DMEEE 303-CONTROL SYSTEMS ENGINEERING

Unit - I:

Unit - II:

Unit – III:
**Unit – IV:**


**Unit – V:**

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

**Text Book:**


**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:


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 subroinie, Code conversion, BCD Arithematic and 16 bit data operations.

UNIT-IV:

**Interfacing 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.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 distributions-Gauss’s law in integral and differential form-concept of electric flux-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 field-Electric fields in dielectric materials-Concept of Polarization.

UNIT-II:


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 - reflection by a perfect conductor-oblique incidence-reflection 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-their 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**:

2. Electromagnetic Waves and Radiating Systems by E.C. Jordan & K.G. Balmain, PHI, N D.

**References**.

1. Electromagnetics by J.D. Draus, MGHl, NY
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:

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:
Reference Books:

DMEEE –307: POWER ELECTRONICS

Unit – I:

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:
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.


Text Books:

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


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.

DMEE-310: ELECTRONICS-II LABORATORY

1. Feedback amplifier.

2. RC Phase shift oscillator.

3. Uien bridge oscillator.


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


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.
14. UJT sweep generation and measurement of errors.
15. Miller or bootstrap sweep generator.

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