

Dr. Babasaheb Ambedkar Technological University, Lonere – 402 103				
B.Tech. Electrical Engineering				
Semester IV				
Code	Course of Study	L	P	C
EE 401	Electrical Machines -II	4	-	8
EE 402	Power System I	4	-	8
EE 403	Instrumentation	4	-	8
EE 404	Electronic Devices and Circuits (E D C)	4	-	8
EE 405	Elective I	4	-	8
ID 406	History of Science & Technology (Self Study course (objective: University level common exam))	-	-	4
EE 407	Electrical Machines – II Laboratory	-	2	2
EE 408	Measurement & Instrumentation Laboratory		2	2
EE 409	Electrical W/s		2	2
XC 409	NSS/NCC/Sports/Arts			
	Total	20	6	50

*Term work evaluation #Practical/Viva Voce

Elective -I

- 1) Electrical Engineering materials
- 2) Electricity and Telegraphy act

Department of Electrical Engineering
SEMESTER - IV

(EE401) ELECTRICAL MACHINE-II

Teaching Scheme :
Lecture : 04 Hrs/Week

Examination Scheme
Theory : 70
Test : 30
Total : 100

Unit 1

Performance & testing of D. C. Machine:

Factors controlling the speed of D.C. series shunt & compound motor, their speed control methods (flux control, armature control), electric braking of shunt & series motors (Rheostatic, plugging), Necessity of starters, shunt & series motor starters (Two point, three point & Four point starters).

Unit 2

Testing of D.C. Motors: Importance of testing, break test, Swinburn's test, Hopkinsons test, Field test, retardation test. Application of D.C.motors.

Parallel operation of D.C. Generators with numericals & the field of application.

Unit 3

Operating characteristics of three-phase Induction motor: Computation & circle diagram, principles, experimental test required for plotting circle diagram, construction of circle determination of performance parameter like full load & maximum quantities.

Unit 4

Starting of induction motor, squirrel cage motor starters (primary resistors, auto transformer, star-delta starters), slip-ring motor Starters (rotor resistance starter), crawling of induction motor, magnetic locking (cogging), double cage motors, equivalent circuit.

Unit 5

Speed control methods, control from stator side: by applied voltage, frequency, No. of stator Poles: Control from rotor side: rotor rheostat, cascade, EMF injection in rotor circuit.

Unit 6

Testing of three-phase induction motor: heat run test, HV test, OC test, SC test, and Megger test. Different tests on single-phase induction motor.

References :

- 1) Say M. G., "Design & performance of A.C. Machines", (Book Publications, 3rd edition)
- 2) Clayton E. W., "Design & Performance of D. C. Machines", (Pitman Publications, 2nd edition)
- 3) Bhimra P. S., "Electric Machines", (South Ex Publications, New Delhi)

(EE402) POWER SYSTEM-I

Teaching Scheme :
Lecture : 04 Hrs/week

Examination Scheme
Theory : 70
Test : 30
Total : 100

Unit 1

Major Electric Equipments: Descriptive treatment of alternator exciter & excitation systems, Transformers, Control panels, Metering & other control room equipments.

Unit 2

Inductance: Definition, Inductance due to internal flux of two wire single phase line of composite conductor line, Concept of GMD, Inductance of three phase line with equal & unequal spacing, vertical spacing.

Unit 3

Capacitance: Concept of electric field, Potential difference between two points in space, Effect of earth's surface on electric field, Computation of capacitance of single phase, three phase transmission lines with & with out symmetrical spacing for solid & composite conductors.

Unit 4

Transmission: Types of conductors, Choice of conductor materials, Stranded copper & ACSR conductor, Insulation consideration, Different types of insulator, supports, distribution of voltage across the insulator string, String efficiency, skin effect, Ferranty effect, proximity effect.

Unit 5

Current and Voltage relation: Representation of short, medium & long transmission lines, P. U. quantities, evaluation of ABCD parameters and surge impedance loading, power flow through transmission line, circle diagram, evaluation of relation between sending and receiving end current & voltage, Interpretation of transmission line equation, Numericals, Line current, % regulation, Transmission efficiency, numericals based on above.

Unit 6

Mechanical Design of Transmission Line: Effect of wind & ice coating on transmission line, sag due to equal & unequal supports, with their derivation, Numericals.
Corona: Phenomenon of corona, factors affecting the corona, Power loss & disadvantages of corona.

References:

- 1) Kothari Nagrath, "Electric Power System", (Tata McGraw Hill Publications)
- 2) Wadhva S. L., "Electric Power System", (Tata McGraw Hill Publications)
- 3) Stevenson W. B., "Power System", (English Language Book Society publications)

(EE 403) INSTRUMENTATION

Teaching Scheme
Lecture: 04 Hrs/Week

Examination Scheme
Theory : 70
Test : 30
Total : 100

Unit 1

Introduction: Basic measurement and instrumentation systems and its representation, Standards and calibration, Symbols, Static and dynamic characteristics, Specifications and selection of instruments, System equations, Dynamic response, Systematic and random errors and their evaluation.

Unit 2

Digital Instrumentation: Voltage and Current measurement, Digital voltmeter (DVM), Principle of A.C. voltage measurement, Average, Peak, R.M.S. responding detectors, Direct current probes, A.C. current probes, Digital frequency measurement, Phase measurement using X-OR phase detection, Digital power measurement using PWM techniques, Transducers for above measurements which give 4 to 20 mA or 0 to 10 mA output range.

Unit 3

Magnetic Measurements: Induction B-probe coil with integrator, Galvanometric devices using Hall effect, Field strength, H-saturation core transducers, Foester probe, Resistivity of Ferro-resistive metal layers, guard probe, ferro-magnetic materials, Investigation, Hysteresis loop, Communication curve, KOEPSSEL direct measurements & separation of iron losses.

Unit 4

Transducers – Different types, selection, application for measurement of force, motion, torque, power, pressure, temperature, flow, acoustic & signal analysis. Disturbance Capacitive and magnetic disturbances, Attenuation with shielding, Long term disturbances, Co-axial cables, Ground and supply loop disturbances, Guard protection.

Unit 5

Compensation: Voltage compensation, Principle of operation, Automatic, Analog, manual, Digital & Automatic digital compensation, Current compensator, Principle of operation & its use as ohmmeter.

Unit 6

Microprocessor Based Measurements: Micro controller, Microprocessor, Auxiliary hardware, Interface logic, Selection and application of microprocessor, Function of typical microprocessor, Microprocessor based instruments, IEEE 488 bus, Microprocessor controlled instruments.

References :

1. Cooper.W. D– Electromagnetic Instrumentation & Measurement Techniques.(Prentice Hall Of India).
2. Rangan, Mani & Sharma – Instrumentation Devise & System.(Tata Mcgraw Hill).

3. Boweles .J.– Digital Instrumentation.(Mcgraw Hill)

Course : B.TECH. Electrical

SEM - IV

(EE 404) ELECTIVE-I (ELECTRONIC DEVICES AND CIRCUITS)

Teaching Scheme
Lecture: 04 Hrs/Week

Examination Scheme
Theory : 70
Test : 30
Total : 100

Unit 1

P-N Junction Diode: Principle of operation & characteristics, point contact diode, Photo diode, LED, Schottky diode, Junction breakdown & zener diode, Junction capacitance, Switching characteristics of diode, Half wave, Full wave rectifiers, Evaluation of performance, Analysis of filter circuits for rectifier, Diode clipping & clamping circuit.

Unit 2

Junction Transistor : Principle of operation & characteristics, Different parameter, h- parameter equivalent circuit, parameter calculation, Transistor as a switch, Transistor biasing

Unit 3

Transistor as an Amplifier, load line, Small signal low frequency analysis of single stage amplifier in different configuration, High frequency equivalent circuit of transistor (hybrid pi), Cascade amplifier, High input resistance circuits-C coupled amplifier Frequency response, Definition of 3 db bandwidth, Effect of cascading on gain & BW, Classification of amplifiers.

Unit 4

Block diagram of operational amplifier, Properties of ideal operational amplifier, Explanation of different terms appearing in OP-Amp application (offset, bias, quantities, PSRR, CMRR, A_d , A_C , Slew rate etc.), Operation of circuit diagram of OP-Amp using discrete components & I.C. diagram, Different types of current of current sources in I.C. technology, frequency response of OP-Amp, OP-Amp parameters & minimization technique of temperature effect, Inverting & Non-inverting operation of Op-Amp & analysis for AG, RI, RO, Linear & non-linear circuit application of OP-Amp

Unit 5

78XY series voltage regulators, Typical application for positive, negative & floating type voltage regulators, Current boosting, Switching type regulators, Protection used in voltage regulators, IC 555, IC 565 parameters operations & applications, Boolean algebra, D'Morgans theorem, OR, AND inverter gate positive & negative logic, Simplification of Boolean expressions (Use of karnaugh mapping).

Unit 6

Logic families, TTL, CMOS.

IC memory operation such as RAM, ROM, PROM, EPROM, EPROM-2732 pin connection, Block diagram.

Half & full adder, Half & full subtractor, Decoders, Multiplexers, S-R, J-K, flip flops, Race round condition, Master slave J-K Flip Flop, Counters (Asynchronous & synchronous type)

References :

- 1) Malvino Albert," Principles of Electronics", (Tata McGraw Hill Publications)
- 2) Mottershed Allen," Electronic devices and circuits", (Prentice Hall of India Pubs)
- 3) Halkies Millman, "Electronic devices and circuits"(Tata McGraw Hill Publications)
- 4) Grabal Arvin, "Microelectronics", (Tata McGraw Hill Publications)
- 5) Gaikwad Ramakant, "Operational Amplifier" (Prentice Hall of India Pubs)
- 6) Malvino Lench, "Digital Electronics", (Tata McGraw Hill Publications)

(EE 405) ELECTIVE-I (INTRODUCTION TO NON CONVENTIONAL SOURCES OF ENERGY)

Teaching Scheme
Lecture: 04 Hrs/Week

Examination Scheme
Theory : 70
Test : 30
Total : 100

Unit 1

Energy scenario in India Sources of energy systems, fossil and renewable. Impact of fossil fuel based systems. Renewable energy sources and features.

Unit 2

Solar Thermal Systems: introduction to Solar thermal systems. Energy conversion principle and applications; solar water heaters, space cooling, solar distillation. Solar cooking, solar green house, solar production of hydrogen, simple illustrative numerical.

Unit 3

Solar Photovoltaic System: Operating principle concept of P V cell, module, array and array combination. Applications; battery charging, pumping, lighting. Simple illustrative numerical.

Unit 4

Wind Energy System: Principle of wind energy conversion. Basic components of wind energy conversion system, classification of wind energy conversion system and design concepts. Extraction of power Simple illustrative numerical.

Unit 5

Energy Storage Systems: Mechanical energy storage, electrical storage, chemical storage, electromagnetic energy storage, thermal energy storage, biological storage.

Unit 6

Energy conservation : Economic concept of energy, principle of energy conservation energy conservation technology, energy audit and co-generation.

References:

1. G D Rai. " Non Conventional Sources of Energy".(Khanna publications)
2. H P Garg and Jai praksh " Solar Energy Fundamentals and applications",(Tata McGraw Hill Publications)
3. D Mukharjee and S Chakrabarti " Fundamentals of Renewable Energy Systems" (New Age International Publication)
4. L Umanand "Non Conventional Energy System" Web Course NPTEL Course No 22 Electrical Engineering. Email: ums@cedt.iisc.ernet.in

(EE406) ELECTRICAL MACHINES - II LABORATORY

Teaching Scheme :
Practical : 02 Hrs/Week

Examination Scheme
Term work : 25
Pr / Oral : 25
Total : 50

List of experiments:

Minimum of Eight experiments based on the curriculum from the following list should be performed.

- 1) To control the speed of DC shunt motor a) Flux control b) Armature control.
- 2) To control the speed of DC series motor a) Field tapping method.
- 3) To study the different types of electric braking a) Rheostatic b) Regenerative c) Plugging.
- 4) To study the three point & four point starter of DC Shunt motor.
- 5) To conduct brake test on DC Motor.
- 6) To conduct Swinburn's test on DC motor.
- 7) To conduct Hopkinson test on DC Motor
- 8) To conduct Field test on DC Motor.
- 9) To conduct Retardation test on DC Motor
- 10) To study the conditions for parallel operation of DC Generator.
- 11) To conduct No Load and blocked rotor test and to determine performance characteristics of three-phase induction Motor from circle diagram.
- 12) To study the different types of starters for three-phase induction motor.
- 13) To control the speed of induction motor by v/f .
- 14) To control the speed of induction motor by i) star-delta ii) autotransformer.
- 15) To control the speed of wound rotor induction motor by rotor resistance control method.

References :

- 1) Say M. G., "Design & performance of A.C. Machines" (Book Publications, 3rd edition)
- 2) Clayton E. W., "Design & Performance of D. C. Machines" (Pitman Publications, 2nd edition)
- 3) Bhimra P. S., "Electric Machines", (South Ex Publications, New Delhi)

(EE407) MEASUREMENT & INSTRUMENTATION LABORATORY

Teaching Scheme :
Practical : 02 Hrs/Week

Examination Scheme
Term work : 25
Pr / Oral : 25
Total : 50

List of experiments :

Minimum of Eight experiments based on the curriculum from the following list should be performed.

Group I: Experiments based on Measurement

1. Calibration of Ammeter & Voltmeter.
2. Measurement of Resistance using Kelvin's double bridge.
3. Study of Megger & Measurement of insulation and earth resistance.
4. Measurement of inductance using Maxwell bridge.
5. Measurement of capacitance using Desatu's principle.
6. Calibration of 1- ϕ energy meter at various power factor.
7. Measurement of power, power factor, maximum demand using trivector meter.

Group II: Experiments based on Instrumentation

1. Study of different types of transducers for measurement of different electrical quantities.
2. Study of voltage and currents compensation.
3. Plotting of Hysteresis loop for ferromagnetic material.
4. Temperature measurement by using microprocessor and microcontroller.
5. Measurement of pressure by using microcontroller.

References :

1. Cooper W. D – Electromagnetic Instrumentation & Measurement Techniques. (Prentice Hall Of India).
2. Rangan, Mani & Sharma – Instrumentation Device & System.(Tata Mcgraw Hill).
3. Boweles .A.J– Digital Instrumentation.(MagrawHill).

Course :B. TECH. Electrical

SEM – IV

(EE408) Electrical Workshop

Teaching Scheme :
Practical : 02 Hrs/Week

Examination Scheme
Term work : 25
Pr / Oral : 25
Total : 50

Workshop practices:

Students are required to study the circuit fabrication techniques and build the small circuit boards and test the same using standard testing devices like multimeters, oscilloscope etc

Course :B. TECH. Electrical

SEM – IV

(EE409) NSS/NCC/SPORTS/ARTS (Audit course)