Faculty of Engineering & Technology

।।अंतरी पेटवू ज्ञानज्योत।।

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

Syllabus For

THIRD YEAR ENGINEERING (T.E.)

ELECTRICAL ENGINEERING

TERM- I & II

(W.E.F.2007-2008)

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING AND EVALUATION
T.E.(*ELECTRICAL ENGINEERING*)
FIRST TERM
W.E.F. 2007-08

Sr. No	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Electrical Installation, Estimation and Distribution	4	--	2	3	100	25	--	--
2	*Electromagnetic Engineering	4	1	--	3	100	25	--	--
3	Power System-II	4	--	2	3	100	25	25	--
4	Electrical Machines-II	4	--	2	3	100	25	25	--
5	Microprocessor and Micro controller	4	--	2	3	100	25	25	--
6	Software Applications	--	--	2	--	--	50	--	--
	Total	**20**	**1**	**10**	**--**	**500**	**175**	**75**	**--**
	Grand Total	**31**			**750**				

SECOND TERM

Sr. No	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Power Electronics	4	--	2	3	100	25	--	--
2	Electrical Measurement-II	4	--	2	3	100	25	25	--
3	Control System-I	4	--	2	3	100	25	25	--
4	Electrical Machine Design-I	4	--	4	3	100	50	--	25
5	Industrial Organization and Management	4	1	--	3	100	25	--	--
6	Practical Training / Mini Project / Special Study	--	--	2	--	--	25	--	--
	Total	**20**	**1**	**12**	**--**	**500**	**175**	**50**	**25**
	Grand Total	**33**			**750**				

* Common with TE (Electronics, Electronics and Communication, Electronics and Telecommunication).

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – I

Electrical Installation , Estimation and Distribution

Teaching Scheme	**Examination scheme :**
Lectures : 4 Hrs/ week	**Paper :** 100 marks (3Hrs)
Drawing : 2 Hrs / week	**Term work :** 25 marks

Unit I

Supply Systems : typical transmission and distribution system from generation to utilization (overall layout). A.C. transmission , d.c. transmission and comparison between them .

Types of transmission : overhead transmission , underground transmission and comparison between them.

Various systems of transmission: dc systems –two wire dc, two wire dc with midpoint earthed, dc three wire system; single –phase systems – single –phase two wire , -single phase two wire with midpoint earthed , single phase three wire system; two –phase ac systems ; two phase three wire system, two phase four wire system ; three phase a.c. system- three phase three wire system, three- phase four wire system.

Cost of conductors in overhead and underground systems.

Different types of tariffs. **(10 Hrs. : 20 marks)**

Unit II

Overhead transmit line components : The support –poles , towers , and their types ; cross arm and clamps ; guys and stays. Conductors-characteristics of conductor material , types of conductor- solid conductor , bundle conductor, concentrically standard conductor (AAC, ACAR conductor). Insulators – types (pin , strain, shackle and suspension insulator), comparison between them, requirement of material, failure of insulators, testing and protection od insulators..

Fuses –types and operation .

Underground cables ; classification , construction of cable, requirements of insulating materials , insulation resistance , capacitance dielectric stress in single-core/multi-core/ sheathed /armored cables. Grading cables – capacitance grading and inter sheath grading.

Causes of failure of underground cables, cable faults and location of faults.

(10 Hrs. : 20 marks)

Unit III

Earthing : Neutral Earthing methods-solid ,resistance ,reactance, voltage transformer, zig-zag transformer .

Design of distribution system : A.C. distribution – service mains design , design of radical and ring distributors for concentrated , distributed loads and combination of both types of loads, feeder design based on Kelvin's law Lamp Flickers-types and design, Application of capacitors to distribution system. **(10 Hrs. : 20 marks)**

Unit IV

Alarm and timer circuits ; basic alarm circuits for audible and visible signals, types of timers, time sequence charts for reset and sequential timers, time delay relay circuits, thermal time delay and electronic time delay relays, contactors.

Control panel : Introduction , advantages , symbols used on control panels, types of control panel, control panel components , toggle switches , controllers, timers, relays, protection circuits; introduction to SCADA and PLC panels ,distribution automation

(10 Hrs. : 20 marks)

Unit V

Illumination : nature of light , definitions –plane angle , luminous flux luminous intensity , illuminance and their units, luminous efficiency ; laws of illumination – inverse square law and Lambert's cosine law , polar curves.

Requirements of good lighting scheme: Polar curves, direct, indirect , semi direct , semi-indirect lighting.

Design of lighting scheme : factors to be considered , working plane space to height ratio, absorption factor, maintenance factor , depreciation factor , coefficient of utilization ; design of illumination schemes for industrial workshops assembly halls, street lighting.

Design of flood lighting schemes: factors like reflection factor , waste light factor and beam factor and design of such schemes for typical installation.

Design and Estimation : design and estimation of installation of domestic , commercial , industrial heads as peer IE rules and IS 732 ; design and estimation of town or village electrification schemes as per IE rules and IS 732 **(10 Hrs. : 20 marks)**

Drawing sheets;

1. Transmission line components : Five insulators –one piece pin, three piece pin type , suspension insulator (one disc) string insulator (one disc), shackle insulator; towers for single circuit and double circuit lines; lightening arrestor, stays, clamps, pin; typical pole including service mains, HT, LT lines supporting pole , 'H' type pole.
2. Distribution substation; Two views (front view and side view) of distribution substation layout ; single line diagram, pipe earthing , plate earthing.
3. Wiring diagrams and symbols**:** minimum 25 symbols as per IS standards.
   Any four circuit diagram out of the following: 1 Rotor resistance starter, 2. Scooter /motor cycle electric wiring diagram,
4. Lift (passenger /goods) or crane, 4. Automatic star /delta starter, 5. Auto synchronous motor starter, 6. Battery charging circuit, 7. Maximum demand indicator.
5. Project on illumination design of laboratory / workshop or small scale industrial establishment along with estimation.
6. Project on electrification of given area showing distributors , feeders and substations along with estimation.

The term work should include five drawing sheets and reports based on the above topics.

References

Author	Name	Publisher
1. J.B.Gupta	Transmission and Distribution	S.K.Kataria and Sons, New Delhi.
2. S.L.Uppal	Electrical Wiring , Estimation and costing	Khanna Publishers, New Delhi.
3. W.N.Alerich	Electric motor control	D.B.Taraportwala and Sons, Mumbai
4. S.L.Uppal	Electric Power	Khanna publishers, New Delhi.
5. H.Pratap	Art and Science of Electrical Utilization	Dhanpat Rai and Sons, New Delhi.
6. B.D.Arora	Electric Wiring, Estimating and Costing	New Heights, New Delhi

7. I.E.Rules.
8. Practical Relay Circuits, Frank J.Oliver, D.B. Taraporewala and Sons , Mumbai -1

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRONICS, ELECTRONICS and COMMUNICATION, ELECTRONICS and TELECOMMUNICATION,ELECTRICAL)
W.E.F : 2007- 08
TERM – I

ELECTROMAGNETIC ENGINEERING

Teaching scheme:
Lectures : 4 hrs/week
Tutorial : 1 hrs/week

Examination scheme:
Theory Paper : 100 Marks (3 Hrs).
Term Work : 25 Marks

UNIT – I

Electrostatics:- Coulomb's law, Electric field due to line charge, Sheet charge and volume charge densities,
Electric flux density, Gauss's law and Divergence theorem. Energy, Potential and Work-done, Potential
gradient. Dipole and its electric field, Dipole movement. Energy density in electrostatic field.
Lectures-10, Marks -20

UNIT-II

Conductor, Dielectrics and Capacitance:- Current and current density. Current continuity equation, Properties of conductors, Boundary conditions (C.D.I. and D.D.I.). Energy stored in capacitors, Poisson's and Laplace's equation's, Capacitance between parallel plates and co-axial cable using Laplace's equation. **Lectures-10, Marks -20**

UNIT-III

Magnetostatics:- Biot-Sarverts law and its vectorial form, Magnetic field due to infinitely long current carrying conductor ,Ampere's Circuital law. Application to co-axial cable. Curl operator, Magnetic flux density, Stoke's theorem. Scalar and Vector magnetic potential. Lorentz's Force equation. Energy stored in magnetic field. **Lectures-10, Marks -20**

UNIT-IV

Time Varying Fields:- Faradays law , Maxwell's equations (Differential , Integral and Phasor forms). Uniform plane waves. Representation of wave motion in free space, perfect dielectrics and Lossy dielectrics (Wave equations). Pointing Theorem and Power density. Propagation in good conductor and Skin effect. Reflection of Uniform plane waves. VSWR.
Impedance matching ,Single stub and Double stub transmission line. Introduction to Smith Chart. **Lectures-10, Marks -20**

UNIT-V

Radiation and antennas: - Radiation resistance. Radiation pattern. Calculation of Radiation resistance for short dipole, Short monopole, Half-wave dipole and Quarter-wave monopole antennas. Directivity, Reciprocity between Transmitting and Receiving antennas, Hertzian dipole, Vector retarded potential.
Types of Antennas: - Folded dipole, Yagi-uda, Horn antenna, Parabolic and Cassegrain feed antenna. Broadside, End fire, Binomial, Tchebysheff antenna arrays. Principle pattern multiplication, General pattern of two isotropic radiators,. **Lectures-10, Marks -20**

REFERENCES:

1) **"Engineering Electromagnetic" by W. Hayt, TMH. (5^{th} or 7^{th} edition).**
2) **"Antenna and Wave Propagation" by K. D. Prasad , Satya Prakashan.**

Topics	Reference No / Name and Author	Lectures
Unit-I	**1(Hayt)**	**10 Lectures**
Unit-II	**1(Hayt)**	**10 Lectures**
Unit-III	**1(Hayt)**	**10 Lectures**
Unit-IV	**1 and 2 (Hayt) and K. D. Prasad**	**10 Lectures**
Unit-V	**1(Hayt) K. D. Prasad**	**10 Lectures**

Termwork:- Assignment for the termwork will be based on the problems on each unit (min.FIVE Assignment).

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – I
POWER SYSTEM-II

Teaching scheme:	**Examination scheme:**
Lectures-4 hrs/week	**Theory scheme**: 100 marks (3hrs)
Practical: 2 hrs/week	**Term work**: 25 marks
	Practicle: 25 marks

Unit-I

Introduction: - Growth of national and international power system, constituents of power systemand role, role of digital computers in operation control and analysis of power system, different aspect of power system analysis and necessity ,relationship, and use of both under normal and abnormal condition .

Complex power: Real, reactive , complex power component, load on system and it's composition, nature and variation, load voltage frequency ,real power load frequency, real power load voltage frequency, reactive power load voltage dependency and method of voltage control. **(10 hrs, 20 marks)**

Unit-II

Long transmission line: V/I relation, hyperbolic equation, ABCD constants, propagation constant, surge impedance and loading, incident and reflected voltage/ current efficiency and regulation on load, equivalent " T " and " π " models, Ferranti effect.

Power system model: Single line impedance and reactance diagrams and their use, PU system, relation, selection of base, reduction of common base and advantages, application of impedance diagrams, representation and modeling of 3 winding transformer,

(10 hrs, 20 marks)

Unit-III

Symmetrical Fault analysis:- 3 phase s.c. analysis of unloaded alternator – subtransient, transient and steady state current , impedances , dc offset ,effect of instant s.c. on the waveforms ,estimation of fault currents with and with-out pre fault current for simple power system ,selection of circuit breakers and current limiting reactors.

Unit-IV

Unsymmetrical Fault analysis: method of Symmetrical components, relationship, advantages, representation of power system by positive, negative, zero sequence diagrams with p.u. values, nature of sequence impedances, L-L, L-G, L-L-G Fault analysis of unloaded , pre-loaded , alternators and simple power system with and with –out Fault impedances.

(10 hrs, 20 marks)

Unit-V

Load flow analysis: Development of mathematical model of simple system by network reduction, nodal voltage/mesh current forms, concept of Z and Y matrices and their ,relation Concept of Load flow analysis, formulation of power flow equations (PFE's) consideration of constraints, bus classification in adopting final strategy solution of power flow equations, outline of Gauss, Gauss seidal and N-R method to solve non linear equations in the form of power flow equations. **(10 hrs, 20 marks)**

References:-

1. W.D. Stevenson – Elements of Power System Analysis, Tata McGrawHill
2. Olle I. Elgard, Introduction to electrical energy system theory, Tata McGraw- hill.
3. I. J. Nagernath, D. P.Kothari, Modern power system Analysis,Tata McGraw hill.
4. B. R. Gupta , Power system analysis and Design,

List of Experiments;

1. Measurements of ABCD constants of long transmission line and plotting of circle diagram to estimate performance parameters.
2. The effect of VAR compensation on receiving and voltage profile of transmission line using capacitor bank.
3. Determination of steady state power limit of a transmission line.
4. Measurement of sub-transient reactance of salient pole synchronous machine by static/Dalton- Cameron method.
5. Study of load flow on a three-bus power system using A.C. network analyses or by actual simulation.
6. Measurement of sequence reactance of a synchronous machine.
7. Fault analysis for symmetrical 3 phase fault by simulation or by ac dc analyzer
8. Unsymmetrical fault analysis for LL,LG, LLG FAULT ON A.C / D.C network analyzer.
9. Computer- added solution of a 3 bus load flow problem using gauss seidal method
10. Formulation of " Y bus " matrix using computer program.

The term works should include a minimum eight experiment from the above list.

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – I
Electrical Machines-II

Teaching Scheme:	**Examination:**
Lectures: 4Hrs./Week	Paper:100 marks
Practical: 2Hrs./Week	Termwork:25 marks
	Practical: 25 marks

Unit-I

Synchronous machines:- Principle of generator action and motor action ; construction – rotating field type ; rotating armature type ,salient pole type , Arrangement of armature winding, E.M.F. equation , winding factors.

3 Ø Synchronous generator :- Alternator on- load ,no load condition; effect of armature current ; armature reaction ;resistance drop; Concept leakage flux; and leakage reactance; armature reactions rotating m.m.f.;production of electromagnetic torque; concept of synchronous reactance and synchronous impedance.

Unit-II

Voltage regulation –definition; regulation by direct load testing, short circuit ratio. Regulation of non salient pole alternator by synchronous impedance method; (e.m.f. method); m.m.f. method; potier triangle; and A.S.A.method.

Two reaction theory for salient pole machines, direct axis and quadrature axis reactance; their determination by slip test; phasor diagram of salient pole alternator and calculation of regulation.

Power: - power angle relation for non salient pole machines and salient pole (steady state power angle charct.) losses in alternator and efficiency.

Unit-III

Parallel operation of alternator: alternators working single and alternator working with infinite bus bar Parallel operation of alternator; load sharing between 2 parallel alternators.

Parallel generator theorem- synchronizing –lamp method and use of synchroscope, synchronizing torque; operating chart of alternator working with infinite bus bar.

Time period oscillation. an alternator connected to infinite bus bar working as motor ,if prime mover is failed. Representation of syn. M/c in a power system network

Unit-IV

Synchronous motors:- motor action , phasor diagram on the basis of synchronous impedance, expression for gross mechanical power develop; power flow. Operatation with const. Load and variable excitation : locus of tip of current phasor under the above condition and v curve

Operatation with const. exciation and variable load : locus of tip of current phasor circle phasor. Starting method, hunting and it causes and remedies.

Unit-V

Harmonics- Concept of time and space harmonicsand their generation, effect of harmonics on performance of synchronous machines, remedies.

1 Ø Induction motors- construction, rotating field theory, equivalent circuitand T-N characteristics, test to determine equivalent circuit parameters.

Types, constructions, connections, T-N characteristics, comparison with 3 Ø I.M.;

Special purpose machines:- universal motor, repulsion motor, reluctance motor, hystresis motor, printed circuit motor, linear induction motor,.

REFERENCES

Author	Name	Publisher
M.G.Say	Performance and design of A.C.machine	ELBS.
A.S.Langsdort	Theory of alternating current machinery , Second edition	Tata McGraw - Hill
Nagrath and Kothari	Theory and Problems of Electrical machines	Tata McGraw – Hill
E.D.Taylor	Performance and Design of A.C.Commutator	ELBS
S.K.Bhattacharya	Electrical machines Second Edition	Tata McGraw – Hill

List of Experiments:

1. Direct loading test on three phase alternator.
2. O.C. and S.C. test on alternator: determination of its regulation by e.m.f. method and m.m.f. method.
3. Zero power factor test on alternator: regulation by Potier method and A.S.A. method.
4. Slip test on salient pole synchronous machine: determination of direct and quadrature-axis synchronous reactance and hence regulation by two reaction theory.
5. Synchronizing alternators: lamp methods and use of synchroscope.

Group B :

6. V- Curves of synchronous motor at constant load.
7. Load test on synchronous induction motor or synchronous motor at constant excitation.
8. Study of various types of single-phase induction motors.
9. No load and blocked rotor tests on capacitor – start single –phase induction motor and determination of parameters of equivalent circuit.
10. Load test on single phase induction motor.

The term work should include a minimum of eight experiments four each from groups A and B of the above list. The term work marks will be based on performance in theory and practicals having a weightage of 40 % and 60 % respectively.

MICROPROCCER &MICROCONTROLLER

Teaching scheme:
Lectures-4 hrs/week
Practical: 2 hrs/week

Examination scheme:
Theory scheme: 100 marks (3hrs.duration)
Term work: 25 marks
ORAL: 25 marks

Unit-I

8085 Intel microproccer: Organization, architecture, Generation of control signal,Addressing mode, Instruction format , Instruction set, classification of instructions, interrupt.- interrupt structure , Assembler , types of Assembler.

(10 Hour, 20 marks)

Unit-II

stack , subroytine, types of subroutine , Programming in assembly language, Programms on 8085, data transfer technique, -synchronous & asynchronous, interrupt driven data transfer, and polling data transfer, parallel data transfer ,memory organization & interfacing, chip capacity, memory module, address space,. Memory specification, Types of memory- ROM, RAM, PROM, EPROM, EEPR0OM, static & dynamic.

(10 Hour, 20 marks)

Unit-III

Study of common peripheral devices, their architecture & different modes of operation- 8255 PPI, mode 0, 1, BSR mode, ; 8279 keyboard display interface, , 8155, static RAM, I/O ports, timers. DMA controller 8257 **(10 Hour, 20 marks)**

Unit-IV

8086 Microproccesor- architecture, memory segmemtation,parrelel processing, addressing modes,reviw of instruction set of 8086.
D to A – types, Ladder, R-2R
A to D converters, SAR type, dual slope. **(10 Hour, 20 marks)**

Unit-V

Microcontroller-

Signal description of 8051, register set of /8051, timmer & modes i/o port strucher.
Microproccer Applications in –b power system, measurement of voltage, frequency, power factor, Electrical drives- stepper motor control, D.C. motor speed control,

(10 Hour, 20 marks)

REFERENCE:

1. Microproccer Architecture, programming, & Applications with 8085, third edition, R.S.Gaonkar.
2. 8085 Assembly languages programming Leventhal, McGraw hill
3. Microproccer & digital system second edition, Douglas V. Hall McGraw hill
4. Fundamental of Microproccer & Microcomputers B, Ram, Dhanpat Rai & co.
5. Microprosser & interfacing programming& hardware.D.V.hall McGraw hill

List of Experiments-

1. Study of Architecture of 8085. Microproccer & write program of 8 bit addition & subtraction.
2. Instruction set of 8085. & write program of 16 bit addition & subtraction.
3. write program for asending/ desending/comparision of given number.
4. study of different memories & write program of block transfer.
5. Study of 8255 PPI
6. Study of 8253 PIT
7. Study of D/A & A/D converter.
8. Study of 8259 interrupter controller.
9. Study of Architecture of 8086.
10. Applications in power measurement
11. Applications in Electrical drives speed control
12. Study of micro controller based system.

The term work should contain minimum 8 experiments from above lists

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL) W.E.F 2007--2008
TERM - I
SOFTWARE APPLICATION – I

Teaching scheme: **Examination scheme:**
Practical : 2 hrs/week **Term Work : 50 Marks**

Objectives:
To make the students aware of:
1. Programming practice in C for numerical methods .
2. Use of application specific software tools in the design development simulation and testing of electronic circuits .
3. Use of mathematical software packages for understanding and modeling electrical signals and linear systems .

Section- A : **Numerical computational techniques**:
Instruction of following techniques assited by C programme/ function implimentation of at least THREE of them is expected .
Solution of transcendental &polynomial equation, bisection method,Newton Raphson ,secant, successive methods, solution of linear equations using Gauss elimination .Gauss-Jordan methods Newton's forward and backward difference equations, interpolation, numerical integration and differentiation: trapezoidal rule Simpson's 1/3 and 3/8 rule, Euler's Method.

List of suggested assignments:
1: Program to solve numerical methods : bisection method, Newton Raphson method using users defined functions. Functions should incorporate parameter passing techniques.
2. Program using Functions to solve differential equations by Euler's modified method.
3. Program using Function to find integration by Simpson's 1/3 and 3/8 method.

Section B: Simulation of typical circuits using circuit simulation tools
(1) Two stage amplifiers.
(2) Series regulatator.
(3) Combinational Logic
(4) Timer Circuit

REFERENCES:
W H Hayt / J E Kemmerly / S M Durbin : Engineering circuit Analysis, TMH 6/e

Note: Term work should be based on minimum **FIVE** assignments, **THREE** from section **A** and TWO from section **B .**

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – II
POWER ELECTRONICS

Teaching scheme:
Lectures-4 hrs/week
Practical: 2hrs/week

Examination scheme:
Theory scheme: 100 marks (3hrs.)
Term work: 25 marks

Unit-1

Modern Power Semi-conducting Devices: Introduction, Basic Structure, ON-OFF Control and Operational Charact. and Applications. Viz;
Gate Assisted Turn-off Thyristors (GATT), Bi-directional Diode Thyristors (DIAC), Bi-directional Triode Thyristors (TRIAC), Silicon Unilateral Switch (SUS), Silicon Controlled Switch (SCS), Insulated Gate Bipolar Transistor (IGBT), Metal- Oxide Field Effect Transistor (MOSFET), Programmable Unijunction Transistor (PUT), Light Activated Silicon Controlled Rectifiers (LASCRs), Gate Turn Off Thyristors (GTO), Static Induction Thyristors (SITH), Field Controlled Thyristors (FCT), MOS Controlled Thyristors (MCT). **(10 Hours, 20 marks)**

Unit-2

Thyristors: Principle of Operation, Operating Charact. of SCR, Turn on Methods, di / dt , dv/dt Protection,
Commutation: Forced and Natural, Classification of Forced Commutation- Class A, Class B, Class C, Class D, Class E, Class F. Gate Triggering Circuits- R, RC, UJT Triggering.
Internal Power Dissipation and Temp. rise, Multi-Connections of SCRs. Series, Parallel connection, String Efficiency, SPICE Thyristor model.

(10 Hours, 20 marks)

Unit-3

Full Wave controlled Rectifiers: M-2 and M-6 Connections, Bridge Circuits, Single Phase B-2 Connection, Three Phase B-2 Connection, Analysis of Bridge Circuits, Half Controlled Bridge Circuits, Single Phaseand Three Phase, Analysis of Line Commutated Control rectifiers, Input-Output Charact. Effect Source Impedance and Load Impedance, Effect of Overlap angle, Inter-Phase Reactor Connection.
Power Factor Improvement: Phase Angle, Symmetrical Angle, PWM.

(10 Hours, 20 marks).

Unit-4

Inverters: classification, Series inverter, Parallel inverter, Single Phase and Three Phase Current Source Inverters (CSI), Voltage Source Inverters, Bridge Inverters With Conduction modes, Inverter Fed Induction Motor with V/ F Control.
Dual Converters : Principle of Operation Ideal and Non-ideal, Dual Converters With and Without circulating current Schemes.
Cycloconveters: Principles, Single Phase Cycloconveters, Control Circuit.

(10 Hours, 20 marks

Unit-5

Dc Choppers: Basic Principle of Operation, Step Up / Step Down Chopper, Chopper Configuration, Class A, Class B, Class C, Class D, Class E, Multi-purpose Choppers.
Ac Choppers: Single Phase and Three Phase with R, RL Load.
Frequency Changer, Doubler, Tripler, High Frequency Conversion.
AC Regulators: Single Phase Half and Full wave R,RL load, Three Phase AC regulators.
Solid State Speed Control of Dc motors: Chopper fed Separately Excited DC motors.

(10 Hours, 20 marks)

References:

1) M. Rashid, Power Electronics, PHI Pub.
2) M.D. Singh and Khanchandani, Power Electronics, TMH Pub.
3) M. Rammamurty, An Introduction to Thyristors and its Applications, East-West Press.
4) Shingare, Industrial and Power Electronics, Electo-Tech. Pub.

List of practical

1) Triggering Circuit of SCR
2) Characteristics of SCR,MOSFET,
3) Commutation circuit class C, class D
4) Single phase full wave controlled rectifiers R, R-L characters tics
5) Single phase semi-converter
6) Three phase full wave controlled rectifiers
7) Step up chopper
8) Step down chopper
9) Series and parallel inverter
10) Three phase inverter

Minimum eight experiments out of ten are to be conducted.

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – II

ELECTRICAL MEASUREMENT-II

Teaching scheme:
Lectures-4 hrs/week
Practical: 2 hrs/week

Examination scheme:
Theory scheme: 100 marks (3hrs.)
Term work: 25 marks
Practical: 25 marks

Unit-I

A .C. Bridges : classification, Maxwell, Anderson ,hay, Schering, Campbell,and wein bridge ,accessories and errors ,Special measuring instruments- construction and principles of 1 Ø and 3 Ø p.f.meters ,frequency meters ,synchronoscope, trivector meter , max. Demand indicators, multimeter, C.R.O. **(10 hours, 20 marks)**

Unit-II

Introduction to instrumentation: definition, purpose, measurement – definitions, types and classification of instruments, generalized measurement system, standards, and calibrations.
Instrument Response - Instrument Response to step, ramp, sinusoidal i/p up to second order system. Errors – types – gross, systematic, random, limiting, sources of errors, techniques to minimize them. **(10 hours, 20 marks)**

Unit-III

Introduction to transducers - definition, classification, selection of transducer.
Measurement of temperature - using R T D, thermocouple, bimetallic thermocouple. Pressure thermometers, pyrometers.
Pressure Measurement- Bourdon Tubes, bellows, diaphragms.
Vacuum Measurement- McLeod gauge, pirani gauge. **(10 hours, 20 marks)**

Unit-IV

Flow measurement- Rota meter, electromagnetic flow meter, hot wire anemometer, ultrasonic flow meter.
Level measurement – mechanical, pneumatic methods , electrical methods- capacitance level gauge, hot wire / carbon resistance method nucleonic level gauge, ultrasonic method.
Displacement measurement – LVDT, strain gauge, -types, working principles, measurement circuitry, temperature compensation, and application. **(10 hours, 20 marks)**

Unit-V

Recorders- necessity, construction, working, types- strip chart, circular chart, self balance potentiometric, X-Y recorder, ultraviolet recorder.
Electronic technique – for measurement of voltage, current, power, energy, phase angleand rms values. **(10 hours, 20 marks)**

Reference:-

1) Golding, widding, Y.P.Chopra ,Electrical Measurement and measuring Instruments – 5th edition, (A.H.Wheelerand co.Ltd.)
2) C.T.Baldwin ,Fundamental electrical measurement- 2 nd edition, lyall book depot.,
3) E.B.Deoblin,Measurement system- Application and design, 4 th Edition , Mcgrawhill.
4) B.C.Nakva,Instrumentation, measurement and analysis- TAta McGraw hill.
5) A.K.Sawhne.A course in electrical and electronic measurement and Instrumentation, 11 th Edition, Dhanpat Ray and co.
6) H.S.kalsi ,Electronics Instrumentation TAta McGraw hill.

List of Experiments-

1. Measurement of inductance by Andersons Bridge.
2. Measurement of capacitance and loss angle of capacitor by Schering bridge.
3. Measurement of frequency / mutual inductance by campbell's bridge.
4. Strain Measurement using strain gauge .
5. Study of LVDT.
6. Measurement of temperature by RTD/Thermocouple.
7. Study of pressure transducers.
8. Study of recorders.
9. Measurement of speed by magnetic pick-up / photo electric method.
10. Study of CRO of it's different types and Applications.
11. Step response of meters.
12. Measurement of systematic errors of wattmeter..

The term works should include a minimum eight experiment from the above list.

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – II
CONTROL SYSTEM-I

Teaching scheme:
Lectures-4 hrs/week
Practical: 2 hrs/week

Examination scheme:
Theory scheme: 100 marks (3hrs.)
Term work: 25 marks
Practical: 25 marks

UINT I
Introduction to atomic control: open loop and close loop system, servomechanisms, mathematical modeling of physical system, transfer function- definitions assumptions, transfer function of simple electrical and mechanical system, block diagram-constructions of block diagram for system equations, block diagram reduction techniques, single flow graphs, and mason's gain formula. Effect of feed back on sensitivity to parameter variation and reduction of noise. **(10 Hrs. 20 Marks)**

UNIT II
Control system components: electrical/ electromechanical components such as ac/ dc. servo motors ,stepper motors potentiometer, techogenerators, there functional analysis and operating characteristics and there applications, pneumatic controls devices
(10 Hrs. 20 Marks)

UNIT III
Time response analysis: time responses of first and second order systems to standard inputs. Transient response specifications, types of system, error analysis, error coefficient, steady state errors, dynamic errors series. Approximate methods for higher order system proportional, derivative and integral control **(10 Hrs. 20 Marks)**

UNIT IV
Stability: Stability of control systems, characteristics equations, impulse response, Routh Hurwitz stability criterion, relative stability. Root locus: construction of root locus, determination of roots from root locus, condition of variable parameters for stability effect of addition of poles and stability. Stability of control systems, characteristic equation, impulse response, Routh Hurwitz stability criterion, relative stability
(10 Hrs. 20 Marks)

UNIT V
Frequency Response of linear system
Specification of polar plots of various systems, Nyquist criteria / Nyquist plots and stability analysis, bode plots from open loop transfer functions for various systems, gain margin and phase margin, stability analysis from Bode plots, Estimation of approximate transfer functions from the frequency response. **(10 Hrs. 20 Marks)**

Reference books:

1) Nagrath I.J ,Control system engg. –.- Wilay Eastem
2) Ogate K.Modern control system: -prentice hall of India
3) Kuo B.C ,Linear control system -.- khanna publications.

List of experiments:

1) Study of potentiometer as on
   a) Error detector
   b) Determination of sensitivity
   c) Determination of input and output characteristics.
2) Study of
   a) synchro characteristics.
   b) Electrical zeroing of syncro.
   c) Synchronous as error detector.
   d) synchros on position control system
3) To determine the transfer functions of armature and field controlled dc generator.
   40to determine transfer function of dc generator.
5) To study performance characteristic of dc motor angular position control system.
6) To plot the torque speed characteristic of two phase ac servomotor.
7) Frequency response plot of second order system.
8) To determine transfer function of AC servomotor...
9) Operation of stepper motor in single step and multistep.
10) Study of P, PI, and PID controller.

The term work should include a minimum of 8 experiments from the above list.

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – II

ELECTRICAL MACHINE DESIGN-I

Teaching scheme:
Lectures-4 hrs/week
Practical: 4 hrs/week

Examination scheme:
Theory scheme: 100 marks (3hrs.)
Term work: 50 marks
Oral-25 marks

Unit-I

Introduction- principles of design and design factors, rating, specifications, standards, performances, brief study of magnetic, electric, dielectric and other material.

Design of Induction Motors-1 phase and 3 phase.

(10 hours,20 marks)

Unit-II

Design of electric Apparatus and devices:- detailed design of heating coils, rotor resistance starters, regulators, field coils, choke coils, and Introduction to design of lifting magnets.

(10 hours,20 marks)

Unit –III

Design of Transformer- Design of distribution and power Transformer,-types, classifications, specifications, design of main dimension, core, yoke, winding, tank, cooling tubes, radiators, estimation of leakage reactance for equal height of H.V. and L.V. winding, resistance of winding, calculation of losses, determination of voltage regulation and efficiency, calculation of mechanical forces develop during short circuit, their estimation and remedies.

(10 hours,20 marks)

Unit- IV

D.C.Machine Windings- types of d.c. Windings, choice and design of simplex and duplex lap and wave Windings, equalizer connections, dummy coils, concept of multiplex Windings , reason for choosing them. **(10 hours,20 marks)**

Unit- V

A.C. Machine Windings- single and double layer, single phase ac Windings with integral and fraction slots, three phase Windings. **(10 hours,20 marks)**

Reference:-

1. A. K .Sawhney, Electric machine design tenth edition, Danpat ray and sons.
2. A. E .clayton, Performance and design of DC machine, third edition, ELBS, Isaac pitman sons.
3. A. E. clayton Performance and design of AC machine, third edition, ELBS, Isaac pitman sons.
4. N. Vinogradov, Electric machine winder, MIR publication.
5. N. PerelmuterRepair of Windings and insulation of Electric machine, N.Perelmuter.
6. Say and Taylor, D.C. Electric machine, Say and Taylor, ELBS, pitman sons.
7. Feinberg,Macmillan,Modern power Transformer design practices.first edition, Feinberg,Macmillan,
8. Transformers BHEL.

Drawing Sheets-

1. **one of electric devices From following:**
   a) Rotor resistance starter for slip ring I.M.
   b) DC series/shunt generator field regulator.
   c) DC series/shunt generator field regulator for speed control.
   d) Lifting Magnet.
2. Details and assembly of three phase Transformer.
3. Details and Layout of DC Windings.
4. Details and Layout of AC Windings.

The term work should include four drawing sheets and reports based on actual design of the above topics.

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F: 2007- 08
TERM – II
INDUSTRIAL ORGANISATION and MANAGEMENT

Teaching scheme:
Lectures-4 hrs/week

Examination scheme:
Theory scheme: 100 marks (3hrs.)
Term work: 25 marks

UNIT-I

Basic management-meaning and definition of management, administration, organization concept, contributors to management science, whether management is science, art or profession. MBO, characteristics of MBO , objective benefits, limitations

Forms of business organization - different forms of business organization, organization structure in industry. **(10 hours 20 marks)**

Unit-II

Elementary economics- Basic economics concept, law of demand and supply, law of diminishing utility, elasticity of demand and supply, money- it's evaluation, different, cost and types of cost elasticity of demand, price elasticity, types, MMF of elasticity, demand forcasting **(10 hours 20 marks)**

Unit – III

Plant location and layout- factors affecting Plant location, different types of Plant layout. CPM PERT , quality control manufacturing system

Work study- techniques of Work study-method study, work measurement, therbligs, different charts, diagrams used in method study. **(10 hours 20 marks)**

Unit-IV

Personnel management – manpower planning, recruitment, selection and training of employees, wages, different methods of wage payment, administration, job evaluation,

Merit rating, incentives, essential of good incentive plan.

Financial management – capital, types of capital, source of capital, financial institutes, elements of costs, depreciation, stores and inventory control, money market, capital market, role OF SEBI. **(10 hours 20 marks)**

Unit- V

Marketing management –marketing and selling concept, market survey and research, management productivity, advertising-media of advertising market forcasting

Industrial Laws- The factories Act, minimum wages act, pollution control act, works man compensation act, industrial safety- Causes of accidents, prevention of accidents, legal provisions. Domestic and international market, brand, trademarks, strategies, pricing, distribution channel **(10 hours 20 marks)**

References-

1. O.P.Khanna. Industrial Engineering management-
2. Banga and Sharma, Industrial. Organization and Engineering economics
3. Dutta, Sundaram. Elementary economics,
4. S.A. Sherlekar. Modern business organization and management
5. Philip Kotler, Marketing management.
6. C.B. Mamoria, Personnel management-.

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F: 2007- 08
TERM – II
PRACTICAL TRAINING / MINI PROJECT / SPECIAL STUDY

Teaching scheme: Examination scheme:
Practical : 2 hrs/week Term Work : 25 Marks

- Every student has to undergo industrial / practical training for a minimum period of two weeks during summer vacation between (S.E. Second Term) fourth and (T.E. First Term) fifth term or during winter vacation between fifth and sixth term (T.E. First Term and Second Term).
- The industry in which practical training is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by every student in the beginning of (T.E. Second Term) sixth term along with a certificate from the company where the student took training.
- The report on training should be a detailed one.
- Maximum number of students allowed to take training in a company should be five. Every student should write the report separately.
- In case if a student is not able to undergo practical training, then such students should be asked to

prepare special study report on a recent topic from reported literature .

or

a mini project related to the Electrical branch of engineering.

1. The circuit for mini project must be designed by a student.
2. The circuit should be simulated using any of the standard simulation software available.
3. Result verification for paper design and simulation should be carried out and discrepancies should be discussed.
4. Verified circuit should be assembled and tested on general purpose PCB/ Protoboard for actual working and practical results.
5. Layout of circuit using standard Layout tool (Orcad / Protel / CADstar / Pads / Ultiboard) should be designed and PCB making process should be carried out.
6. Assemble and test the circuit on PCB. Prepare bill of materials.
7. Project report should be detail of work, carried out by student, including layouts, circuits, bill of materials and relevant details

- The practical training / special study / mini project shall carry a term work of 25 marks. Every student shall be required to present a seminar in the respective class in the presence of two teachers. These teachers (fixed by the head of department in consultation with the Principal) shall award marks based on the following:

(a) Report **10 marks.**
(b) Seminar presentation **10 marks.**
(c) Viva -voce at the time of Seminar presentation **05 marks.**

Total 25 marks.

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