DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.SU/Engg./B.E.IInd Yr./03/2017

It is hereby informed to all concerned that, the syllabi prepared by the Committees & recommended by the Dean, Faulty of Science & Technology, the **Academic Council at its meeting held on 20 & 21 June 2017 has accepted the following syllabi in accordance with Choice Based Credits & Grading System for all Branches Second Year Engineering & Master of Computer Application Third Year** under the Faulty of Science & Technology as enclosed herewith.

Sr.No.	Syllabi as per CBC & GS
[1]	Second Year B.E.[Civil Engineering],
[2]	Second Year B.E [Mechanical Engineering],
[3]	Second Year B.E [EE/EEE/Electrical, Electronics & Power,],
[4]	Second Year B.E [Chemical Engineering],
[5]	Second Year B.E [Instrumentation Engineering],
[6]	Second Year B.E [E&TC/E&C/IE/ECT],
[7]	Second Year B.E [CSE/IT],
[8]	Third Year MCA

This is elective from the Academic Year 2017 -2018 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
Ref.No.SU/B.E.IInd & MCA/
2017/ [illegible]
Date:- 28-06-2017.

* * * * *

Deputy Registrar,
Syllabus Section

Copy forwarded with compliments to :-

1] **The Principals, affiliated concerned Colleges, Dr. Babasaheb Ambedkar Marathwada University.**
2] The Director, University Network & Information Centre, UNIC, with **a request to upload this Circular on University Website.**

Copy to :-

1] The Director, Board of Examinations & Evaluation,
2] The Section Officer, [Engineering Unit] Examination Branch,
3] The Section officer, [Eligibility Unit],
4] The Programmer [Computer Unit-1] Examinations,
5] The Programmer [Computer Unit-2] Examinations,
6] The In-charge, [E-Suvidha Kendra],
7] The Public Relation Officer,
8] The Record Keeper,

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

Syllabus of

S.E.

EE/EEE/EEP

Under Choice Based Credits & Grading System

FACULTY OF SCIENCE & TECHNOLOGY

[Effective from the Academic Year 2017-18 & onwards]

Faculty of Science and Technology

Board of Studies in Electrical Engineering
Curriculum structure of SE (EE/EEE/EEP)

PART-I

Sub Code	Semester-I	Contact Hrs./Week				Examination Scheme						Duration of The Theory Examination
	Subject	L	T	P	Total	CT	TH	TW	PR	Total	credits	
BSH/201	Engineering Mathematics -III	4	--	--	4	20	80	--	--	100	**4**	**3 Hrs.**
EED/202	Transformer and DC Machines	4	--	--	4	20	80	--	--	100	**4**	**3 Hrs.**
EED/203	Electrical Measuring Techniques	4	--	--	4	20	80	--	--	100	**4**	**3 Hrs.**
EED/204	Electrical Power Generation and Its Economics	4	--	--	4	20	80	--	--	100	**4**	**3 Hrs.**
	Elective - I	4	--	--	4	20	80	--	--	100	**4**	**3 Hrs.**
EED/221	Lab 1: Transformer and DC Machines	--	--	2	2	--	--	--	50	50	**1**	
EED/222	Lab 2: Electrical Measuring Techniques	--	--	2	2	--	--	--	50	50	**1**	
EED/223	Lab 3: Electrical Power Generation and Its Economics	--	--	2	2	--	--	50	--	50	**1**	
EED/224	Lab 4: Elective	--	--	2	2	--	--	--	50	50	**1**	
EED/225	Lab 6: Fundamentals of PLC	--	--	2	2	--	--	50	--	50	**2**	
	Total	**20**	**--**	**10**	**30**	**100**	**400**	**100**	**150**	**750**	**26**	

Elective –I:

Code	Subject
EED/205	Electrical Engineering Materials
EED/206	Electronics Device and Circuits
EED/207	Numerical Method Using MATLAB
EED/208	Signal and System

L:Lecture hours per week **T**:Tutorial hours per week **P**:Practical hours per week

CT: Class Test, **TH**:University Theory Examination, **TW**: Term Work, **PR**: Practical/Oral Examination

PART – II

Sub Code	Semester-II	Contact Hrs./Week			Examination Scheme							
	Subject	**L**	**T**	**P**	**Total**	**CT**	**TH**	**TW**	**PR**	**Total**	**Credits**	**Duration of The Theory Examination**
BSH/252	Engineering Mathematics-IV	4	--	--	4	20	80	--	--	100	**4**	**3 Hrs.**
EED/253	AC Machines	4	--	--	4	20	80	--	--	100	**4**	**3 Hrs.**
EED/254	Network Analysis	4	--	--	4	20	80	--	--	100	**4**	**3 Hrs.**
EED/255	Electrical Power Transmission and Distribution	4	--	--	4	20	80	--	--	100	**4**	**3 Hrs.**
EED/256	Analog and Integrated Circuits	4	--	--	4	20	80	--	--	100	**4**	**3 Hrs.**
EED/271	Lab 6: AC Machines	--	--	2	2	--	--	--	50	50	**1**	
EED/272	Lab 7: Network Analysis	--	--	2	2	--	--	50	--	50	**1**	
EED/273	Lab 8: Electrical Power Transmission and Distribution	--	--	2	2	--	--	--	50	50	**1**	
EED/274	Lab 9: Analog and Integrated circuit	--	--	2	2	--	--	--	50	50	**2**	
BSH/275	Communication Skills- I	--	**2**	---	2	--	--	50		50	**1**	
	Total	**20**	**2**	**8**	**30**	**100**	**400**	**100**	**150**	**750**	**26**	
	Total of Semester I & II	**40**	**2**	**18**	**60**	**200**	**800**	**200**	**300**	**1500**	**52**	

CODE BSH/201Engineering Mathematics-III
SE (ALL)

Teaching Scheme **Examination Scheme**
Theory: 4 hours/week **Class Test: 20 Marks**
Theory examination: 80 Marks

Objectives:
1) To develop Logical understanding of the subject
2) To develop mathematical skill so that students are able to apply mathematical methods & Principal's in solving problems from engineering fields
3) To produce graduates with mathematical knowledge & computational skill.

Unit 1: Linear Differential Equations: **[8 HRS.]**
Linear Differential Equations with constant coefficients General method, shortcut methods to find particular integral, Homogenous Linear differential equations. (Cauchy's & Legendre's form), method of variation of parameters

Unit 2: **Application of LDE:** **[6 HRS.]**
To Electrical circuits & to Mechanical system (Analogous study of two Systems),To Civil Engineering, Free oscillations / vibrations, Forced oscillation /vibrations, Damped Free oscillations / vibrations, Damped Forced oscillations / vibrations

Unit 3: **[6 HRS.]**
Statistics & Probability:
Measures of Dispersion, Moments, coefficient of skewness and kurtosis probability distributions of random variables, binomials, poisons and normal distributions Curve fitting**:** Principle of least squares, fitting of linear curve, parabola, exponential curve.

Unit4: **[6 HRS.]**
Vector Differentiation:
Differentiation of vectors, Gradient of scalar point function, Directional derivative, Divergence of vector point function, Curl of a vector point function. Irrational and Solenoidal vector field.

Unit 5: **[6 HRS.]**
Vector Calculus (Integral calculus):
The line integral, Surface integral, volume integral, Gauss Divergence theorem, Stoke's theorem, Green's theorem.

Unit6: **[8 HRS.]**
Numerical Methods:

Solution of transdental equations by Newton Raphson method, GaussSeidel method to solve simultaneous linear equations, Lagranges Interpolation formula for unequal intervals, Numerical Differentiation: - Newton's forward and Newton's backward difference formulae, Solution of ordinary differential equation by Euler's modified method, and Runge-Kutta IVth order method

Note: All Theorems are without proofs
Section A: Unit 1, 2, 3
Section B: Unit 4, 5, 6

Reference Books:
1. **A Text Book of Engineering Mathematics (Volume-I, II, III)** by P. N. Wartikarand J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
2. **Higher Engineering Mathematics** by B. S. Grewal, Khanna Publications, New Delhi.
3. **Advanced Engineering Mathematics** by H.K. Das, S. Chand & Company.
4. **Higher Engineering Mathematics** by B.V. Ramana (Tata McGraw-Hill).
5. **Advanced Engineering Mathematics** by Erwin Kreyszig, Wiley Eastern Ltd.
6**. Engineering Mathematics A Tutorial Approach** by Ravish R Singh, Mukul Bhat,Mc Graw Hill

Pattern of Question Paper:
The units in the syllabus shall be divided in two equal sections. Questionpaper shall be set having two sections A and B. Section A questions shall be set on first three units (1,2,3) and Section B questions on remaining three units (4,5,6) . Question paper should cover the entire syllabus.

For 80 marks Paper:
1. Minimum ten questions
2. Five questions in each section
3. Question no 1 and 6 be made compulsory and should have at least ten bits of two marks out of which FIVE to be solved.
4. Two questions from remaining questions from each section be asked to solve having weightage of Marks

CODE EED/202TRANSFORMER AND DC MACHINES

Teaching Scheme **Examination Scheme**
Theory: 4 hours/week **Class Test: 20 Marks**
Theory examination: 80 Marks

Unit 1 **[8 HRS.]**
Working of transformer on-load and on no-load, pharos diagrams Exact and approximate equivalent circuits referred to either side, losses, Efficiency, maximum efficiency, ratings. Open circuit and short circuit tests, determination of equivalent circuit parameters from the test data, Polarity test, Parallel operation, and conditions to be satisfied, load sharing under various conditions.Autotransformers, their ratings and applications. Comparison with two winding transformer with respect to saving of copper and size.

Unit 2 **[8 HRS.]**
Types, construction, comparison with a bank of three single phase transformers, Standard connections, phasor groups as per clock notations, and their suitability for particular applications polarity test, Efficiency and regulations by directs and indirect method, Descriptive treatment of Parallel operation of transformer Scott connections and 'V'- connections, three winding transformers, tertiary windings.

Unit 3D.C. Machine construction **[6 HRS.]**
Construction, main parts, magnetic circuit, typical flux path, Armature winding: Simple lap and wave winding, Commutator and brush assembly.

Unit 4 DC Generator and DC motor action **[8 HRS.]**
Generator and motor action, e.m.f equation, types, characteristics, applications, torque equation of motor, significance of back e.m.f. working at no-load and on-load. Power flow diagram, losses and efficiency. Descriptive treatment of armature reaction. Commutation, causes of bad commutation and remedies, interpoles, compensating windings (descriptive treatment only).

Unit 5 Starting Control and Testing of DC Motor: **[6HRS.]**
Starting of DC motors, starters for series and shunt motor, solid state starters, speed control, tests, Applications

Unit 6 Special Purpose DC Machines: **[4HRS.]**
Construction and operating principles of Brush less DC motor, stepper motor, DC servo motor, PMDC motor.

Text Books:

1. Electrical Technology by Edward Hughes ELBS, Pearson Education.
2. Electrical Technology Vol II by B. L. Theraja
3. Electrical Machine by S. K. Bhattacharya, 2nd Edition, Tata Mc Graw Hill publishing co. Ltd.
4. Electrical Machines by Nagrath & Kothari, Tata Mc Graw Hill.
5. Electrical Machines by Bhag S Guru, Husein R. Hiziroglu, Oxford University Press.
6. Electrical Machines- I and II, K Krishna Reddy, SCITECH Publications (India) Pvt. Ltd. Chennai

Reference Books:

1. Performance and Design of Direct Current Machines by A.E.Clayton and N.N. Hancock CBS Publishers, Third Edition.
2. Electrical Machines by A.E. Fitzgerald, Charles Kingsley, Stephen D.Umans (Tata Mc Graw Hill Publication Ltd) Fifth Edition.
3. Theory and performance of DC machines by A.S. Langsdorf (Tata Mc Graw Hill)
4. Theory and Performance of AC machines by A.S. Langsdorf (Tata Mc Graw Hill)
5. Performance and Design of AC. Machines by M.G. Say (CBS Publishers and Distributors)
6. Electrical Machines by Smarajit Ghosh (Pearson Education), New Delhi.
7. Electrical Machines Theory, Application, & Control by Charles I Hubert (Pearson Education, NewDelhi Second Edition)

PATTERN OF QUESTION PAPER:

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B having weightage of 10 marks each be made compulsory and should have at least eight bits of two marks out of which five to be solved.
4. Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks.

CODE EED/203 ELECTRICAL MEASURMENT TECHNIQUES

Teaching Scheme **Examination Scheme**
Theory: 4 hours/week **Class Test: 20 Marks**
Theory examination: 80 Marks

Unit 1

A) Measurement and Instrumentation theory **[8 Hrs.]**

Characteristics of measuring instruments: Static and dynamic, accuracy, linearity, speed of response, dead zone, repeatability, resolution, span, reproducibility, drifts. Need for calibration, standards and their classification. Block diagram of generalized instrumentation system. Classification of measuring instruments - Absolute and secondary instruments, types of secondary instruments: indicating, integrating, and recording, analog / digital.

B) Essentials of Indicating Instruments **[4 Hrs.]**

Deflecting, controlling and damping systems, construction, working, torque equation, various advantages and disadvantages of MI (repulsion and attraction), and PMMC

C) Ammeter and voltmeter theory **[4 Hrs.]**

Extension of range of ammeters and voltmeters, using shunt, multiplier. Universal shunt, Universal multiplier. Block diagram and operation of digital ammeter and voltmeter in brief.

Unit 2

A) Measurement of Resistance **[4 Hrs.]**

Measurement of low, medium and high resistance. Kelvin's Double Bridge, Ammeter-voltmeter method, Megger, Earth tester for earth resistance measurement, Measurement of insulation resistance when power is ON.

B) AC Bridges **[4 Hrs.]**

Introduction, sources&detectors for A.C. bridge, general equations, for bridge at balance. Measurement of Inductance: Maxwell's Inductance and Maxwell's Inductance-capacitance bridge, Andersons Bridge. Measurement of capacitance, shearing's bridge.

Unit 4

Wattmeter theory and measurement of power **[4 Hrs.]**

Construction, working, torque equation, errors and adjustments of single phase, conventional (induction) energy meter, block diagram and operation of electronic energy meter, three phase energy meter.

Unit 5

Instrument transformers **[4 Hrs.]**

Construction, connection of CT & PT in the circuit, advantages of CT / PT over shunt and multipliers for range extension, transformation ratio, turns ratio, nominal ratio, burden etc. and ratio and phase angle error. (No derivation of formulae is expected

Unit 6

A) Measurement of Resistance **[4 Hrs.]**

Introduction, various parts, front panel controls, block diagram of dual trace and dual beam CRO, for measurement of voltage, period, frequency, phase angle and frequency by Lissajous pattern.

B) Transducers **[4 Hrs.]**

Introduction, classification, basic requirement types-resistive, inductive, capacitive (brief treatment only), advantages of electrical transducers.

Text books

1. A Course in Electrical and Electronic measurements & Instrumentation – by A. K. Sawhaney, Dhanpat Rai & Suns
2. A Course in Electronic and Electronic measurements by J. B. Gupta, S. K. Kataria & Sons.
3. Instrumentation: Measurement and Analysis by Nakra & Chaudhari Sixth Reprint, Tata McGraw Hill, New Delhi.

Reference books

1. Electrical measurement & measuring instrument by E. W. Golding & widing, Fifth edition, A. H. Wheeler & Co. ltd.
2. Electronic measurement and instrumentation by Dr. Rajendra Prasad, Khanna Publisher, New Delhi.
3. Introduction to Measurements and instrumentation by Ghosh, Second Edition PHI Publication.
4. Introduction to Measurements and instrumentation by Anand PHI Publication.

PATTERN OF QUESTION PAPER:

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B having weightage of 10 marks each be made compulsory and should have at least eight bits of two marks out of which five to be solved.
4. Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks

CODE EED/204 Electrical Power Generation and its Economics

Teaching Scheme **Examination Scheme**
Theory: 4 hours/week **Class Test: 20 Marks**
Theory examination: 80 Marks

Unit 01 **[8 HRS.]**
Thermal Power Plants:
Types of boilers, Feed water and its treatment, Steam turbine and alternators. Site selection, Main parts and its working. Fuel Handling: delivery of load, unloading, preparation, transfer, outdoor (dead) storage, indoor (live) storage, in plant Handling, Coal weighing. Ash disposal and dust collation: Draught systems, electrostatic precipitator Prospectus and development of thermal plants in India.

Unit 02 **[8 HRS.]**
Hydro Power Plant:
Site selection, Hydrology, storage and poundage, general arrangements and operation of hydro power plant, Hydraulic turbines, turbine size, pelton wheel turbine, Francis and Kaplan turbines, selection of turbines, Dams, Spillways, gates, intake and out take works, canals and layout of penstocks, water hammer and surge tank, simple numerical on hydrographs and number of turbine required Prospectus and development of hydro plants in India.

Unit 03 **[8 HRS.]**
Nuclear power plant:
Introduction, atomic physics, nuclear reaction, materials, site selection, nuclear reactors and working of each part, classification of nuclear reactor, , nuclear waste disposal, plant layout, Prospectus and development of nuclear plants in India Diesel Power Plants: Introduction, Site selection, Main components and its working, Diesel plant efficiency and heat balance, choice and characteristic of diesel power plant.

Unit 04 **[3 HRS.]**
Gas power plant:
Simple gas turbine power plant, methods to improve thermal efficiency, open loop and closed loop cycle power plants, gas fuels, gas turbine materials, plant layout.

UNIT 05 **[5 HRS.]**
Non-conventional power plant:
Sources, MHD plants, solar energy, fuel cells, tidal power generation, geothermal power generation ,wind power stations, Prospectus and development of non-conventional power plants in India Comparison of all power plants.

Unit 06 **[8 HRS.]**
Economics Aspects of Power Generation:

Introduction, terms commonly used in system operations, factors affecting cost of generation, reduction of cost by interconnecting generators, choice of size and number of generator units, Input output curves of thermal and hydropower plants, Incrementalfuel rate curves, incremental fuel cost curve, constraints on economic generation, economic loading of generators, load allocation among various generators, base load and peak load plants.

Text Books

1. P. K. Nag: Power Plant Engineering, Tata McGraw Hill
2. Dr. P. C. Sharma: Power Plant Engineering,
3. Chakrabarti, Soni, Gupta, Bhatnagar A text book on power system Engineering" Dhanpat Rai publication
4. R.K.Rajput, "Power Plant Engineering"
5. J B Gupta, "Power Plant Engineering"

Reference Books

1. Arora and Domkundwar: A course in Power Plant Engineering, Dhapat Rai publication
2. S. P. Sukhatme: Solar Energy

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For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B having weightage of 10 marks each be made compulsory and should have at least eight bits of two marks out of which five to be solved.
4. Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks

ELECTIVE I

CODE EED/205*Electrical Engineering Materials

Teaching Scheme **Examination Scheme**
Theory: 4 hours/week **Class Test: 20 Marks**
Theory examination: 80 Marks

Unit 01 **[6 HRS.]**

A) Dielectric Properties of Insulating Materials:

Static Field ,Dielectric Parameters [Dielectric constant, Dipole moment, Polarization, Polarizability], Mechanisms of Polarizations-Electronic, Ionic and Orientational Polarization (Descriptive treatment only), Pyro-Electric & Ferro-Electric Materials, Dielectric Loss and loss Tangent.

B) Optical Properties of Materials & Cells used for Power Generation:

Photo-Conductivity, Photo-Electric Emission, Photo-Voltaic cells [Materials Used, Construction, Equivalent Circuit, Working and Application], Photo-Conductive cells, Photo-Emissive cells.

Unit 02 **[8 HRS.]**

A) Insulating Materials, Properties & Application:

Introduction, Characteristics of Good Insulating Material, Classification, Solid Insulating Materials- Paper Press Board, Fibrous Materials, Ceramics, and Mica & Asbestos. Liquid Insulating Materials such as Transformer Oil, varnish , Askarel, Insulating Gases like Air, SF6, Insulating Materials for Power & Distribution Transformers, Rotating Machines, Capacitors, Cables, Line Insulators and Switchgears

B) Dielectric Breakdown:

Introduction, Concept of Primary & Secondary Ionization of Gases(Descriptive treatment only), Breakdown Voltage, Breakdown Strength, Factors affecting Breakdown Strengths of Gaseous, Liquid and Solid Dielectric Materials. Breakdown in Vacuum.

Unit 03 **[8 HRS.]**

Magnetic Materials:

Introduction, Magnetic Parameters [Permeability, Magnetic Susceptibility, Magnetization], Classification of Magnetic Materials, Diamagnetism, Para-magnetism, Ferro-magnetism, Ferri-magnetism, Ferro-magnetic behavior below Critical Temperature, Spontaneous Magnetization & , Anti-ferromagnetism, Ferrites, Applications of Ferro-magnetic Materials, Magnetic materials for Electric Devices such as Transformer Core , Core of Rotating Machines, Soft Magnetic Materials, Hard Magnetic Materials, Magnetic Recording Materials, Compact Discs

Unit 04 **[8 HRS.]**

Conducting Materials:

General Properties of Conductor, Electrical Conducting Materials - Copper, Aluminum and its applications, Materials of High & Low Resistivity - Constantan, Nickel-Chromium Alloy, Tungsten, Canthal, Silver & Silver alloys ,Characteristics of Copper Alloys (Brass & Bronze), Materials used for Lamp Filaments, Transmission Lines, Electrical Carbon Materials, Material used for Solders, Metals & Alloys for different types of Fuses, Thermal Bimetal & Thermocouple

Unit 05 [4 HRS.]

Nanotechnology:

Introduction, Concepts of Energy bands & various Conducting Mechanism in Nanostructures, Carbon Nano-structures, Carbon Molecules, Carbon Clusters, Carbon Nanotubes, Applications of Carbon Nano-tubes, Special Topics in Nano Technology such as Single Electron Transistor , Molecular Machines, BN Nanotubes, Nano wires.

Unit 06 [6 HRS.]

Testing of Materials:

1. Measurement of Tangent ofDielectric LossAngle (tan δ) by Schering Bridge-IS 13585-1994
2. Measurement of Dielectric Strength of Solid Insulating Material-IS 2584
3. Measurement of Dielectric Strength of Liquid InsulatingMaterial -IS 6798
4. Measurement of Dielectric Strength ofGaseous InsulatingMaterial -IS 2584
5. Measurement of P.F. and partial discharge of high voltage cables.
6. Testing of high voltage bushing.
7. Measurement of Flux Density by Gauss-meter

Text Books:

1. A Course in Electrical Engineering Materials by S. P. Seth, Dhanpat Rai and Sons, Delhi -
2. Electrical Engineering Materials, T.T.T.I, Madras
3. Electrical Engineering Materials by K. B. Raina & S. K. Bhattacharya, S. K. Kataria & Sons, Delhi-06.
4. Nanotechnology - A gentle introduction to next big idea by Mark Ratner & Daniel Ratner, Pearson Education
5. Introduction to Nanotechnology by Charles P. Poole, Jr. Frank & J. Ownes (Wiley Student Edition)
6. Introduction to Nano Science & Technology – Chattopadhya

PATTERN OF QUESTION PAPER:

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For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B having weightage of 10 marks each be made compulsory and should have at least eight bits of two marks out of which five to be solved.
4. Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks.

CODE EED/206*Electronics Devices and Circuits

Teaching Scheme **Examination Scheme**
Theory: 4 hours/week **Class Test: 20 Marks**
Theory examination: 80 Marks

Unit 1 [5 HRS.]
Rectifiers and Filters Half wave rectifier, full wave rectifier, bridge rectifier, PIV, efficiency, ripple factor.TUF analysis, Ripple Factor calculation for C, L, LC, voltage multiplier, with diodes, regulation with and without filter, load and line regulation.

Unit 2 **[8 HRS.]**
Theory of Junction Transistors and field Effect Transistor Transistor action – Transistor parameter, Transistor current components, Transistor as an amplifier and as switch , collector efficiency, early effect in transistor, Junction FET operation, Enhancement MOSFET, depletion MOSFET, comparison. JFET and MOSFET. Power MOSFET, Equivalent circuit operation, static characteristics – Transistor testing by different methods.

Unit 3 **[5 HRS.]**
Bias Stability and Device Stabilization Transistor Biasing : Location of Q point, fixed bias circuit, collector to base circuit, self-bias circuit, graphical DC bias analysis, design of all biasing circuits, FET biasing, : self-biasing, voltage feedback biasing.

Unit 4 **[6 HRS.]**
Amplifiers Frequency Response, RC coupled and transformer coupled amplifier, single stage and multi stage amplifier, wide band amplifier, cascade amplifiers, feedback amplifiers, positive and negative feedback, current and voltage feedback. Effect of feedback on gain. Input and output impedance, Noise and distortion. (Derivation treatment.) DC amplifiers: Drift in amplifiers, differential amplifiers.

Unit 5 **[4 HRS.]**
Transistor Model Hybrid parameters: H equivalent , Pi equivalent circuit, small signal single stage amplifier, analysis of CE,CC,CB circuits, voltage gain, current gain, input/output impedance, dependence on source and load impedance, emitter follower analysis, boot strapping in emitter follower.

Unit 6
A. High Frequency Amplifiers High frequency equivalent circuits, for BJT and FET amplifiers, hybrid Pi equivalent circuit, Determination of lower and higher cutoff, frequencies, Effect of junction capacitance and miller's theorem **[4 HRS.]**
B. Power Amplifiers Types: Class A, Class B, Class AB, and Class C, capacitor coupled quasi complimentary, push pull, expression for efficiency of Class A class B amplifier, distortion in amplifier **[4 HRS.]**
C. Oscillators and Tuned Amplifiers Barkhausen criterion, RC and LC oscillators, Crystal oscillators, designing examples. Tuned Amplifiers – Single tuned, double tuned Stager tuned **[4 HRS.]**

Reference books:

1. J. Milliman and C.C. Halkies, “Electronics devices and circuits”, McGraw Hill, 1995.
2. J. Milliman and C.C. Halkies, “Integated Electronics”, McGraw Hill.
3. Malvino A P “Electronics Principles”, McGraw Hill International,1998.
4. David A. Bell,“Electronics devices and circuits”, PHI, 1998.
5. Boylestred R and Nashelsky,”Electronics devices and circuits theory”, PHI 1993.
6. Somnath Nair,”Electronics devices and applications” PHI 2002.
7. Russell L. Meade,”Foundations of Electronics circuits and devices” Thomson Asia.

PATTERN OF QUESTION PAPER:

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For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B having weightage of 10 marks each be made compulsory and should have at least eight bits of two marks out of which five to be solved.
4. Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks

CODE EED/207*Numerical Methods using MATLAB

Teaching Scheme **Examination Scheme**
Theory: 4 hours/week **Class Test: 20 Marks**
Theory examination: 80 Marks

MATLAB is a popular language for numerical computation. This course introduces students to MATLAB programming, and demonstrate its use for scientific computations. The basis of computational techniques are expounded through various coding examples and problems, and practical ways to use MATLAB will be discussed.The objective of this course is to introduce undergraduate students to computational methods using MATLAB. At the end of this course, a student would:

- Learn basics of MATLAB programming
- Get introduced to numerical methods for engineering problems
- Will be able to use MATLAB to solve computational problems

Unit 1: Introduction to MATLAB Programming **[4 hours]**
Basics of MATLAB programming, Array operations in MATLAB, Loops and execution control, Working with files: Scripts and Functions, Plotting and program output

Unit 2: Approximations and Errors **[4 hours]**
Defining errors and precision in numerical methods, Truncation and round-off errors, Error propagation, Global and local truncation errors

Unit 3: Numerical Differentiation and Integration **[7 hours]**
Numerical Differentiation in single variable, Numerical differentiation: Higher derivatives, Differentiation in multiple variables, Newton-Cotes integration formulae, Multi-step application of Trapezoidal rule, MATLAB functions for integration

Unit 4: Linear Equations and Nonlinear Equations **[9 hours]**
Linear algebra in MATLAB, Gauss Elimination, LU decomposition and partial pivoting, Iterative methods: Gauss Siedel, Special Matrices: Tri-diagonal matrix algorithm

Nonlinear equations in single variable, MATLAB function zero in single variable, Fixed-point iteration in single variable, Newton-Raphson in single variable, MATLAB function solve in single and multiple variables, Newton-Raphson in multiple variables

Unit 5: Regression and Interpolation **[7 hours]**
Introduction, Linear least squares regression(including lsqcurvefit function), Functional and nonlinear regression (including lsqnonlinear function), Interpolation in MATLAB using spline and pchip

Unit 6 Ordinary Differential Equations and Practical Aspects **[9 hours]**
Introduction to ODEs; Implicit and explicit Euler's methods, Second-Order Runge-Kutta Methods, MATLAB ode45 algorithm in single variable, Higher order Runge-Kutta methods, Error analysis of Runge-Kutta method. MATLAB ode45 algorithm in multiple variables, Stiff ODEs and MATLAB ode15s algorithm, Practical example for ODE-IVP, Solving transient PDE using Method of Lines

Reference Books:

1. NPTEL Video Course by **Dr. Niket S.Kaisare,** MATLAB Programming for Numerical Computation, http://nptel.ac.in/courses/103106118/

2. Fausett L.V. (2007) Applied Numerical Analysis Using MATLAB, 2nd Ed., and Pearson Education

3. Chapra S.C. and Canale R.P. (2006) Numerical Methods for Engineers, 5th Ed., and McGraw Hill

List of Practical's:

Students will perform any eight from following exercises using MATLAB

1. Write and execute programs to study Scripts and Functions
2. Write and execute program to study Newton-Cotes integration formulae
3. Write and execute program to study Multi-step application of Trapezoidal rule
4. Write and execute program to study Gauss Elimination
5. Write and execute program to study LU decomposition
6. Write and execute program to study Gauss Siedel iterative method
7. Write and execute program to study Newton-Raphson method
8. Write and execute program to study Regression and Interpolation
9. Write and execute program to study Runge-Kutta methods

CODE EED/208* SIGNALS AND SYSTEMS

Teaching Scheme **Examination Scheme**
Theory: 4 hours/week **Class Test: 20 Marks**
Theory examination: 80 Marks

Unit 1 **[8 HRS.]**
Introduction to Signals:
Definition of signal, Classification of signals: continuous time and discrete time, Analog and digital, periodic and non-periodic, deterministic and non-deterministic, even and odd, energy and power. Basic signals and operations on signals: cosine, sine, exponential, unit step, unit impulse. Ramp, triangular, rectangular, Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shifting and folding. Representation of continuous time signals by its sample – Sampling theorem- Reconstruction of a signals from its samples, aliasing – discrete time processing of continuous time signals, sampling of band pass signals**.**

Unit 2 **[6 HRS.]**
System:
Definition, types of systems, Classification of CT and DT system: linear and nonlinear, Time variant and time invariant, casual and non-causal, static and dynamic, Stable and unstable, shift variant and invariant, Inevitability.

Unit 3 **[6 HRS.]**
System Analysis:
System modeling: input output relation, impulse response, block diagram, integraldifferential equations. Introduction to LTI Systems, state space representation, Convolution integral, properties of convolution integral, linear convolution, different methods of convolutions, system properties in terms of impulse response.

Unit 4 **[6 HRS.]**
CT and DT system analysis using FT Definition and necessity of CT and DT Fourier series and Fourier transforms. CT Fourier series, CT Fourier transforms and its properties. Problem solving using properties. Limitations of Fourier Transform. Analogy between CT FS and DT FS and its properties. Response of LTI system to exponential signals, periodic signals, application of Fourier series and Fourier transforms to the system analysis.

Unit 5 **[6 HRS.]**
Correlation:
Definition of correlation and correlogram. Introduction-correlation and correlogram, the correlation function: analogy between correlation and convolution, Conceptual basis, energy signals, power signals, auto-correlation: relation to signal energy and signals power, properties of auto-correlation, Cross-correlation: properties of cross correlation.

Unit 6 **[8 HRS.]**

Energy Spectral Density and Power Spectral Density Definition of Spectral density, ESD, Properties of ESD, Physical interpretation of the ESD Numerical on ESD. PSD, Properties of PSD, Correlation, cross correlation and autocorrelation of CT energy signals and its properties. Numerical on PSD. Applications, interrelation between auto-correlation and ESD. Sampling theorem and its proof, effect of under sampling, sampling of band pass signals.

Reference Books:

1) Roberts M.J.: Signals and Systems TMH
2) Luider: Signals and Systems
3) B.P.Lathi: Linear Systems and signals
4) Signals and Systems: Y. Ravinder, C.K. Kharate.
5) B.P. Lathi: Signals and Systems
6) Symon hykin: signals and systems
7) I.J.Nagrath: signals and systems (TMH)

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided in to equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weightage of units. Section a question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

1) Minimum 10 questions
2) Five questions in each section
3) Question no.1 from section A and question no.6 from section B having weightage of 10 marks each be made compulsory and should have at least eight bits of two marks out of which five to be solved.
4) Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks

LIST OF PRACTICALS:

1) Program for sampling continuous time signal
2) Program for folding, shifting of digital signal
3) Program to generate impulse, unit step, ramp, sine wave, exponential signals,
4) Program for convolution and correlation
5) Program for compute magnitude and phase spectrum of given signals.
6) Program for Jury's stability criteria
7) Program for circular convolution
8) Program to study the properties of Fourier transform
9) Program for linear convolution using DFT
10) Program to compute impulse response of systems
11) Program to compute even & odd part of given signals
12) Program to compute FFT.

LAB-I TRANSFORMERS AND DC MACHINES

CODE: EED/221

Teaching Scheme | **Examination Scheme**

Practical: 2 Hrs. / week | **Practical oral: 50 marks**

Term work shall consist of: Any three experiments on transformer, four on D.C. machine and one on special purpose DC motor.

1. Internal, External, & Magnetizing Characteristics of DC shunt & Series Generator.
2. Load Characteristics of DC Compound Generator
3. Load test on D.C. shunt motor
4. Speed control of D.C. Shunt motor, above and below rated speed.
5. Efficiency and losses calculation of DC motor by Swinburne's test, limitations of this test. 6. Polarity test and ratio test on three phase transformer.
7. Parallel operation of single phase transformer.
8. Performing different 3-phase transformer connections.
9. Efficiency and regulation of three phase transformer by direct loading.
10. Efficiency and regulation of three phase transformer by indirect loading.
11. Working test on special l purpose motors.
12. Swmpner's test on 1-phase transformers.
13 Scott connection of single phase transformers.

LAB-II Electrical Measurement Techniques

CODE: EED/222

Teaching Scheme | **Examination Scheme**

Practical: 2 Hrs. / week | **Practical oral: 50 marks**

List of Experiments:

The term work shall consist of any 8 experiments from the list

1. Measurement of power in three phase circuit using two wattmeter method (Balanced & Unbalanced Loads)
2. Measurement of Reactive power in three phase balanced circuit using one wattmeter method and by one wattmeter method with two way switch.
3. Calibration of Single phase or Three phase static energy meter at different power factors using Digital meters.
4. Measurement of Low resistance using Kelvin's Double Bridge.
5. Measurement of inductance using Anderson's Bridge.
6. Earth resistance measurement by Earth Tester.
7. Extension of instrument range: ammeter, voltmeter, watt meter using CT / PT.
8. Measurement of power in three phase four wire using three CTs and Two wattmeters.
9. Study anduse ofCRO formeasurement of Current, Voltage, Time period, Frequency, Phase angle.
10. Study of electrical transducers

LAB-III Electrical Power Generation and its Economics

CODE: EED/223

Teaching Scheme	**Examination Scheme**
Practical: 2 Hrs. / week	**Term work: 50 marks**

Practical:
The term work shall consist of a record of any FIVE of the following:

PART-A
1. Study of boiler mounting and accessories.
2. Study of modern thermal power plant.
3. Demonstration and study on diesel engine.
4. Demonstration and study on diesel power plant.
5. Study of modern hydroelectric power plant.
6. Demonstration and study of solar photo voltaic system.
7. Demonstration and study of any water turbine.
8. Demonstration and study of a centrifugal pump.
9. Demonstration and study of a pelton wheel turbine, Francis and Kaplan turbines.

PART-B
Arrange one industrial visit to any electrical power generating station and ask the students to submit the report.

LAB-IV Electrical Engineering Materials

CODE: EED/224

Teaching Scheme	**Examination Scheme**
Practical: 2 Hrs. / week	**Practical oral: 50 marks**

List of Experiments:
At least two experiments should be designed by the faculty members and can be included in the term work apart from the experiment list given below. SIX experiments from the list below and remaining two from the experiments designed and set up by the faculty member will form part of term work.
1. To measure electric strength of solid insulating materials as per IS 2584
2. To measure electric strength of liquid insulating materials as per IS 6798.
3. To measure electric strength of gaseous insulating materials using Sphere Gap-Unit.
4. To obtain Hysteresis Loop of the Ferro-Magnetic Material.
5. To understand the principle of thermocouple & to obtain characteristics of different thermocouples.
6. To measure Insulation Resistance & KVA capacity of power capacitor.
7. To measure Resistivity of High Resistive Alloys.
8. To observe development of tracks due to ageing on different insulating materials e.g. Bakelite, Perspex, Mica, Micanite, Fiberglass etc.

9. Testing of Cables as per IS 6380, 6474.
10. Measurement of Tangent of Dielectric Loss Angle (tan δ) by Schering Bridge
11. Measurement of Flux Density by Gauss-meter

LAB:-V Electronic Device and Circuits

CODE: CODE: *EED/225

Teaching Scheme	**Examination Scheme**
Practical: 2 Hrs. / week	**Practical oral: 50 marks**

The practical examination shall consists of performing an experiment on practical work done during the course, the record of the experiments submitted by the candidate and viva-voce based on the syllabus.
The assessment will be based on
1. Performing an experiment
2. Record of experiments submitted by the candidate
3. Viva-voce on syllabus

Minimum eight experiments should be conducted during the course and record (journal) for the same shall be submitted.

List of the Practical:
1. Determination of ripple factor. PIV. Efficiency regulation factor of half wave and full wave amplifiers (with and without capacitors).
2. Comparative study of fixed and self-biased circuits.
3. Study of transformer coupled power amplifiers.
4. Study of transistor characteristics in CE configuration and Determination of h-parameters graphically.
5. Comparison of frequency response of RC coupled amplifiers with feedback and without feedback (comparison of Gain and Bandwidth).
6. Determination of Voltage gain, current gain, input and output impedance of FET amplifiers.
7. Designing and testing of RC phase shift oscillator.
8. Study and frequency calculation of Hartley oscillator.
9. Study and frequency calculation of Colpitts oscillator.
10. Study of class a, class B, class AB amplifiers.

LAB- VI Fundamentals of PLC

CODE: EED/275

Teaching Scheme **Examination scheme:**

Practical: 2 Hrs. /Week **Term Work: 50 Marks**

Unit 01

Modules (interfaces), power supplies, PLC advantages & disadvantages. selection criteria introduction to PLC: definition & history of PLC, overall PLC system, PLC input & output modules, central processing unit, cpus & programmer/monitors, solid state memory, the processor for plc.

Unit 02

Programming of PLC:

Programmingequipment's, proper construction of PLC ladder diagram, basic components & their symbols in ladder diagram, fundamentals of ladder diagram, Boolean logic & relay logic, and analysis of rungs. Input on/off switching devices, input analog devices, output on/off devices, output analog devices, programming on/off inputs to produce on/off outputs.

Unit 03

Advanced PLC Function:

Analog PLC operation, PID control of continuous processes, simple closed loop systems, problems with simple closed loop systems, closed loop system using Proportional, Integral & Derivative (PID), PLC interface, and Industrial process example.

Text Books:

1) Gary Dunning, "Introduction to Programmable Logic Controllers", Thomson, 2nd Edition
2) John R. Hackworth, Frederick D., Hackworth Jr., "Programmable Logic Controllers Programming Methods and Applications"
3) John W. Webb, Ronald A. Reis, "Programmable Logic Controllers: Principles and Application", 5th Edition

Reference Books:

1) Batten G. L., "Programmable Controllers", McGraw Hill Inc., Second Edition
2) Bennett Stuart, "Real Time Computer Control", Prentice Hall, 1988
3) Doebelin E. O., "Measurement Systems", McGraw-Hill International Editions, Fourth Edition, 1990
4) P. K. Srivstava, "Programmable Logic Controllers with Applications", BPB Publications
5) Webb J. W, "Programmable Controllers", Merrill Publishing Company, 1988

List of Experiments:

PART-A

1) Interfacing of lamp & button with PLC for ON & OFF operation.
2) Performed delayed operation of lamp by using push button.
3) Multiple push button operation with delayed lamp for ON/OFF operation.
4) Combination of counter & timer for lamp ON/OFF operation.
5) Set / Reset operation: one push button for ON & other push button for OFF operation.
6) DOL starter & star delta starter operation by using PLC.
7) PLC based temperature sensing using RTD.
8) PLC based thermal ON/OFF control.
9) Interfacing of Encoder with PLC (Incremental/Decremental)
10) PLC based speed, position measurement system. PART-B Submit a mini project based on above syllabus in the group of 4-5 students.

SEMESTER II

Engineering Mathematics-IV

(ETC/EC/CSE/IT/EEE)

CODE: BSH/252

Teaching Scheme
Theory: 4 hours/week

Examination Scheme
Class Test: 20 Marks
Theory examination: 80Mark
Duration: 3 Hrs.

Objectives:

1) To develop Logical understanding of the subject
2) To develop mathematical skill so that students are able to apply mathematical methods & Principal's in solving problems from engineering fields to produce graduates with mathematical knowledge & computational skill.

Unit 1: **[7 HRS.]**

Function of complex variable (Differential calculus):

Introduction, Analytic function Cauchy Riemann equations in Cartesian and Polar form, Harmonic function, Taylor's series & Laurent's series (without proof), Conformal mapping (geometrical representation of function of complex variable), bilinear transformation

Unit 2: **[7HRS.]**

Function of complex variable: **(Integral calculus)**:

Line integral, contour integral: Cauchy's integral theorem, Cauchy's integral formula (without proof), Residues, Cauchy's residue theorem, Integration along unit circle and along upper half of semi-circle

Unit 2: **Application of PDE:** **[6 HRS.]**

Solution of partial differential equation by method of separation of variables, application of vibration of string, one dimensional heat flow equation, Laplace equation in two dimensions with boundary conditions.

Unit 4: Laplace transform: **[6 HRS.]**

Definition, Transforms of elementary functions, properties and theorems of Laplace transform (without proof) transform of periodic functions of Heaviside unit steps Function, displaced unit step function, Dirac delta function, error function, Bessel' function of zero order.

Unit 5: Inverse Laplace transform and its applications: **[6 HRS.]**

Inverse Laplace transforms by using properties, ii) partial fractions, iii) Convolution theorem, Applications to solve linear differential equations with constant coefficients (Initial value problems), Simultaneous Linear Differential equations.

Unit 6: Fourier Transform and its applications: [8 HRS.]

Fourier integral, Fourier sine and cosine integral, complex form of Fourier integral, Fourier transforms Fourier sine and cosine transform and inverse Fourier transforms Finite Fourier sine and cosine transforms. Solution of one dimensional heat equation by using Fourier transform

Reference Books:

1. **A Text Book of Engineering Mathematics (Volume-I, II,III)** by P. N. Wartikar and J. N. Wartikar,
Pune Vidyarthi Griha Prakashan, Pune.
2. **Higher Engineering Mathematics** by B. S. Grewal, Khanna Publications, New Delhi.
3. **Advanced Engineering Mathematics** by H.K. Das, S. Chand & Company.
4. **Higher Engineering Mathematics** by B.V. Ramana (Tata McGraw-Hill).
5. **Advanced Engineering Mathematics** by Erwin Kreyszig, Wiley Eastern Ltd.
6**. Engineering Mathematics a Tutorial Approach** by Ravish R Singh, Mukul Bhat,Mc Graw Hill

PATTERN OF QUESTION PAPER:

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section a questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1) Minimum ten questions
2) Five questions in each section
3) Question no 1 from section A and Question no 6 from section B having weightage of 10 marks each be made compulsory and should have at least eight bits of two marks out of which five to be solved.

Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks.

CODE EED/253AC MACHINES

Teaching Scheme **Examination Scheme**
Theory: 4 hours/week **Class Test: 20 Marks**
Theory examination: 80 Marks

UNIT 01 **[13 HRS.]**
THREE PHASE INDUCTION MOTOR:
Construction, Principle of operation, torque equation and torque ratios, speed equation, speed torque characteristics, Effect of increase in rotor resistance, phasor diagram, equivalent circuit, analysis based on approximate equivalent circuit, no load test, Blocked rotor test, efficiency and losses calculations, induction generator . Double Cage Induction Motor (D.C.I.M.): Construction, Characteristics and Equivalent circuit and applications. Speed control of Induction Motor: starting and types of starters, Speed control methods, Change of supply frequency, pole changing, cascading, Injection of EMF in secondary.

UNIT 02 **[05 HRS.]**
SINGLE PHASE INDUCTION MOTOR:
Types, Construction ,Principles of operation (capacitor start induction run, capacitor start capacitor run, inductor start induction run), phasor diagram, equivalent circuit, Experimental determination of parameter, applications.

UNIT 03 **[05 HRS.]**
SPECIAL PURPOSE MACHINES: Construction and operating principles of AC servomotor, Repulsion motor, FHP synchronous Motor, and Hysteresis motor**.**

UNIT 04 **[05 HRS.]**
SYNCHRONOUS GENERATOR: Construction, Principle of operation, EMF equation, leakage reactance, armature reaction, armature resistance and reactance, field excitation system, damper winding.

UNIT 05 **[08 HRS.]**
PERFORMANCE CHARACTERISTICS OF SYNCHRONOUSGENERATOR:
Calculation of voltage regulation by synchronous Impedance method, MMF method, Zero power factor method, experimental setup for above method, rating, efficiency and losses, method of synchronizing. , synchronizing power ,hunting, damping operation single and Infinite bus, power angle equation, short circuit ratio and its significance. Two reaction theory.

UNIT 06 **[04 HRS.]**
SYNCHRONOUS MOTOR:
Method of starting, phasor diagram, torque and torque angle equation, V –curves and experimental setup, hunting and damping, synchronous condenser**.**

REFERENCE BOOKS:

1 Electrical Machine -3/E –S.J.Chapman –Mc Graw Hill
2 Electrical Machines by Smarajit Ghosh (Pearson Education), New Delhi.
3 Performance and design of A.C.Machines – M.G.Say
4 Performance and design of A.C Commutator motors –O.E.Taylor.
5 Theory of A.C. Machines – Lange's dorf
6 A.C. Machines -Puchastein Lioyd and Conard.
7. Electrical Technology – H.Cotton. TEXT BOOKS: 1. Electrical machines- Dr.P.S.Bhimra- Khanna Publication.

TEXT BOOKS:

1. Electrical machines- Dr.P.S.Bhimra- Khanna Publication
2. Electrical Technology: volume-2 – B.L.Thareja.
3. Electrical Machines –J.B.Gupta.
4. Generalized Machine theory – Dr.P.S.Bhimra.

PATTERN OF QUESTION PAPER:

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B having weightage of 10 marks each be made compulsory and should have at least eight bits of two marks out of which five to be solved.
4. Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks

CODE EED/254NETWORK ANALYSIS

Teaching Scheme **Examination Scheme**
Theory: 4 hours/week **Class Test: 20 Marks**
Theory examination: 80 Marks

Unit 01

A] Types of Networks: **[02HRS.]**

Lumped and distributed linear and nonlinear, bilateral and unilateral, time variant and time invariant, space variant and space invariant. Independent and dependent (controlled) voltage and current sources. Source transformation and shifting**.**

B] Network Equations: **[04HRS.]**

Network equations on loop basis and node basis, choice between loop analysis and node analysis. Concept of super node and super mesh, concept of voltage and current divider, mutual inductance, dot convention for coupled circuits, Concept of duality and dual networks.

Unit 02 **[04HRS.]**

Superposition, Thevenin, Norton, Reciprocity, Substitution, Compensation, Millmans theorems applied to electrical networks with all types of sources.

Unit03 **[10HRS.]**

Solutions of differential equations and network equations using Laplace transform method and classical method for R-L,R-C and R-L-C circuits (series and parallel),Inverse Laplace transforms, transformed networks with initial conditions. Analysis of electrical circuits with applications of step, pulse, impulse & ramp functions, shifted & singular functions the convolution integral. Laplace transforms various periodic and non-periodic waveforms application of Laplace transforms**.**

Unit 04 **[06HRS.]**

Two Port Network: Z, Y, H and transmission parameters, Inter-relations between parameters. Input power, Power transfer and Insertion loss: Energy and power, Effective or Root-Mean –Square values, Average power and complex power, Problems in Optimizing power transfer, Insertion Loss.

Unit 05 **[06HRS.]**

Fourier Analysis : The Fourier series, Evaluation of Fourier coefficients, symmetry considerations, exponential form of Fourier series, steady state response to periodic signals.

Unit 06 **[08HRS.]**

Network Functions: Poles and Zeros, Terminal pairs or ports, network functions for the one port and two port, The calculation of network functions ,ladder networks, general networks. Poles and zeros of network functions, Restrictions on poles and zeros locations for transfer functions, Time –domain behavior from the pole and zero plot .Stability of active networks.

Text Books:

1. "Network Analysis" by M. E. Van Valkenburg. Third Edition, Prentice Hall of India Private Limited.
2. Network Theory by N. C. Jagan, C. Lakshminarayana, Second Edition, BSP Publication. 3. Network Analysis & Synthesis – G. K. Mittal, Khanna Publication.
4. Introduction to Electric Circuits by Richard C. Dirof, James A. Svoboda, Sixth Edition, Wiley.
5. Introduction to Electric Circuits -Alexander & Sadiku.
6. Introduction to Electric Circuits –S Charkarboorty.
7. Fundamentals of Electrical Networks- B.R.Gupta & Vandana Singhal – S.Chand Publications
8. Electrical Circuit Analysis by P. Rameshbabu, Scitech PublicationIndia Pvt Ltd, Second Edition

Reference Books:

1. Network Analysis by Cramer McGraw Hill Publication.
2. "Engineering Circuit Analysis" by William H. Hayt, Jr. Jack E. Kemmerly, McGraw Hill. 3. "Introduction to Circuit Analysis" by Bolylestad Robert L.
4. Electric Circuits and Networks by K.S. Suresh Kumar, Pearson Education
5. Network Analysis, N.C. Jagan, Second Edition, BS Publication, Hyderabad

PATTERN OF QUESTION PAPER:

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B having weightage of 10 marks each be made compulsory and should have at least eight bits of two marks out of which five to be solved.
4. Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks.

CODE EED/255 Electrical Power Transmission and distribution

Teaching Scheme **Examination Scheme**
Theory: 4 hours/week **Class Test: 20 Marks**
Theory examination: 80 Marks

Unit 01 **[8HRS.]**

A)Different types of distribution systems, like ring main ,and radial distribution, types & choice of distribution system conductor, types of loads in transmission and distribution systems, Load curve , load duration curve, load factor, demand factor, diversity factor, load forecasting concept.
B) Tariff: Residential, commercial, H.T., L.T. Time of Day tariff, Incentives and penalties.

Unit 02
A)Major Electrical equipment's in Transmission Sub-Stations: [04HRS.]
Descriptive treatment of ratings, Special features, field of use of equipment's like transformers, bus-bars, voltage regulators, switches and isolators, reactors, Control panels, metering, power supplies like station transformers, storage batteries and other control room equipment's in sub-stations.
B)Overhead line insulators:[03HRS.]
Types of insulators, pin type, suspension type, shackle type, strain type insulators, voltage distribution along string of suspension insulators, cripage distance of insulators string efficiency, Equalization of potential across each unit.

Unit 03
Constants of Transmission Line: [08HRS.]
Inductance, Resistance of line, skin effect and its effects, proximity effect, inductance of single phase two wire line, flux linkage of one conductor of one group, inductance of composite conductor line , concept of G.M.R. and G.M.D., inductance of three phase line with equilateral spacing, inductance of parallel circuit three phase line, three phase line with equilateral spacing, unsymmetrical spacing, double circuit three phase line, Calculation of inductance to be done with and without transposition.

Unit 04
Constants of Transmission lineCapacitance: [08HRS.]
Concept of G.M.R. and G.M.D for capacitance calculations, capacitance of three phase line with equilateral spacing, capacitance of parallel circuit three phase line with equilateral spacing, unsymmetrical spacing, double circuit three phase line, capacitance of single phase line with earth effect and without effect of earth's surface on electric field, calculation of capacitance to be done with and without transposition.

Unit 05

A) Circuit Representation of Lines and generalized Circuit Constants: [06HRS.]

Classification of lines based on length as short, medium and long lines. Ferranti Effect Representation of lines as 'Pi' and 'Tee' circuits using R,L and C parameters voltage and current relations for short and medium lines only. Representation of 'Tee' and 'Pi' models of lines as two port networks, evaluation and estimation of ABCD constants for both the models**.**

B) **Long transmission line**: **[02HRS.]**

Current and voltage relationship, hyperbolic equations, Equivalencecircuit

Unit 06

A) Mechanical design of overhead lines: **[02HRS.]**

Line supports, spacing between the conductors, length of span, calculation of sag, equal and unequal supports, effect of ice and wind loadings.

B) Underground Cable: [02HRS.]

Classification, Construction of cable, XLPEcables, insulation resistance, capacitance, dielectric stress in single core/multi core cables, cable faults and location of faults.

Text Books:

1. A text book on Power System Engineering by A Chakraborty, M.L.Soni, P.V.Gupta, U.S. Bhatnagar, Dhanpat rai & Co., Delhi.
2. Power System Analysis & Design by B.R.Gupta, 4th Reprint, S.Chand Publishing Co.
3. Power System Analysis by W.D. Stevenson, Tata McGraw Hill Publications.
4. Transmission and Distribution by J.B. Gupta, S.K.Kataria & Sons, New Delhi. 5. Electric Power Generation, Transmission and Distribution by S.N.Singh, Prentice Hall of India.

Reference Books:

1. Elements of Power Station Design by M.V. Deshpande, Wheeler Publishing.
2. Modern Power System Analysis by I.J. Nagrath and D.P.Kothari, Tata Mc Graw Hill Publications.
3. Generation and Economic Considerations by J.B.Gupta, S.K.Kataria & Sons, New Delhi.
4. Power System Engineering by Nagrath & Kothari, Tata McGraw Hill Publications.
5. Websites of MERC and MSEDCL
6. Power System Analysis by Arthur R. Bergen. Pearson Education, New Delhi.

PATTERN OF QUESTION PAPER:

Six units in the syllabus shall be divided in two equal parts i.e. 3 units in each part. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B having weightage of 10 marks each be made compulsory and should have at least eight bits of two marks out of which five to be solved.
4. Two questions from remaining questions from each section A and B be asked to solve each having weight age of 15 marks.

CODE EED/256 ANALOG AND INTEGRATED CIRCUITS

Teaching Scheme **Examination Scheme**
Theory: 4 hours/week **Class Test: 20 Marks**
Theory examination: 80 Marks

UNIT 1. Operational Amplifier: **[08HRS.]**
Introduction, block diagram of op amp, Op amp (IC741), specifications, packaging, characteristics, as and dc parameters and their measurements, noise and frequency compensation. Ideal and practical Op amp comparison, concept of virtual short and ground, Op amp technologies and comparison-bipolar and BICMOS.

UNIT 2. Op Amp Linear and nonlinear Applications: **[08HRS.]**
Inverting and non-inverting amplifiers, voltage follower, summing amplifier, differential amplifier, instrumentation amplifier and its applications, voltage to current converters and current to voltage converters, analog multipliers, low voltage ac and dc voltmeter.
Differentiator, integrator, comparator and its characteristics, zero cross detector, Schmitt trigger, Schmitt trigger IC LM339, window detector, peak detector, sample and hold circuit, precision half wave and full wave rectifier, log and antilog amplifier.

UNIT3. Wave Generators: **[06HRS.]**
Square wave, triangular wave and saw tooth wave generator, phase shift and wein bridge oscillators and its design, function generator using ICL 8038. Multi vibrators using timer IC-555.

UNIT4. Active filter design: **[08HRS.]**
Introduction comparison between active and passive network design, transfer function, first order low pass active filter, standard second order low pass and high pass butter worth filters, KRC filters, multiple feedback filters, state variable and bi quad filter, band pass, band reject, all pass filter, active filter performance considerations, switched capacitor filter (first and second order), Tow Thomas filters, filter using MATLAB.

UNIT5.Phase lock Loop: **[06HRS.]**
Basic phase lock loop principle, transient response of PLL, linear model of PLL, Major building blocks of PLL, analog and digital phase detector, VCO, Applications of PLL, Monolithic PLL, IC LM 565 and CD4046 CMOS PLL.

UNIT6. Voltage Regulators: **[04HRS.]**
Introduction, Basics of voltage regulator, linear voltage regulator using Op amp, single polarity linear voltage regulator, IC voltage regulators-IC723, General purpose regulator, Switching Regulator IC78s40 and its applications.

LAB: VII AC MACHINES

ODE: EED/271
Teaching Scheme **Examination Scheme** **Practical: 2 Hrs. / week**
Practical oral: 50 marks

TERM WORK: Minimum Eight experiment based on above syllabus given in the list.

LIST OF EXPERIMENTS:
1. Study of A.C. Machines.
2. No load and Blocked rotor test on 3-PHASE induction motor
3. Load test on 3-phase I.M.
4. Speed control of Induction Motor
5. Parameter calculation of single phase induction motor from No load and Blocked rotor test
6. Determination of voltage regulation of alternator using Synchronous Impedance method.
7. Determination of voltage regulation of alternatorby directloading method
8. Determination of voltage regulation of alternator using Zero power factor method.
9. Regulation of alternator by slip test.
10. Parallel operation of alternator.
11. V-Curves of Synchronous motor.
12. Reversal of Synchronous motor.

LAB: VIII NETWORK ANALYSIS

CODE: EED/272
Teaching Scheme **Examination Scheme**
Practical: 2 Hrs. / week **Term Work: 50 marks**

List of Practical:
Any four experiments from the first five of the following and any four experiments from rest of the list. (Minimum four experiments should be based on simulation software PSPICE/MATLAB along with hardware verification)
1. Verification of Superposition theorem in A.C. circuits.
2. Verification of Thevenin's theorem in A.C. circuits.
3. Verification of Reciprocity theorem in A.C. circuits.
4. Verification of Millman's theorem.
5. Determination of time response of R-C circuit to a step D.C. voltage input. (Charging and discharging of a capacitor through a resistor)
6. Determination of time response of R-L circuit to a step D.C. voltage input. (Rise and decay of current in an inductive circuit)
7. Determination of time response of R-L-C series circuit to a step D.C. voltage input.
8. Determination of parameter of two port network.
9. Harmonic analysis of no load current of a transformer.
10. Determination of resonance, bandwidth and Q factor of R-L-C series circuit.
11. Determination of resonance of R-L-C Parallel circuit.

LAB-IX Electrical Power Transmission and Distribution

CODE: EED/273

Teaching Scheme	**Examination Scheme**
Practical: 2 Hrs./ week	**Practical oral: 50 marks**

PART-A

Minimum Eight Experiments should be taken.

1. Study of Transmission Sub-station & Drawing sheet of 132kV or 400kV sub-station.
2. Study and Drawing sheet of pin type, strain type, 7 shackle type insulators.
3. Measurement of ABCD parameters of a transmission line (on model kit).
4. Measurement of capacitance of std. cable sample of 1-mtr length, using Shearing Bridge.
5. Meggering of armored cable with2500V megger.
6. Identification of faults in cable.
7. Mat-lab simulation of transmission line model.
8. Mat-lab simulation of faults in transmission line model.
9. Study of ACSR conductors.
10. Evaluation of line parameters of ‘π’ model. (Expt. On model kit.)
11. Evaluation of line parameters of ‘T’ model. (Expt. on model kit.)

PART: B Visit to transmission station and submit the report individually

LAB- XI Communication Skill

CODE: EED/275

Teaching Scheme	**Examination scheme:**
Tutorials: 2 Hrs. /Week	**Term Work: 50 Marks**

Course curriculum

UNIT I Grammar and Usage: [07HRS.]

- Overviews of basic Mid-Level English Grammar.
- Parts of speech
- Preposition and conditionals.
- Tense and Concept of Time.
- Sentence Construction (Concord).
- Vocabulary: Words, idioms, phrases, Antonyms and Synonyms.

UNIT II Speaking Skills: [05HRS.]

- training in sound recognition
- Stress and intonation pattern in spoken communication.
- Rhythm and effective English Communication.
- Sound Recognition Exercise (Language lab exercise)
- Common Error English.

UNIT IIIListening and Reading Skills: [03HRS.]

- Active and Passive Listening.
- Note Taking Tips
- Techniques of Reading.
- Types and Techniques- Skimming and scanning of Reading.

UNIT IVWriting Skills [05HRS]

- Identification of Different writing Styles (Four Writing Styles)
- Business letter.
- E-mail Writing
- Report Writing
- Job Application
- Resume Application
- Drafting: Memo, Circular, Notices, Agendas etc.

Term Work:-

Minimum Practical 8 out of 11 to be conducted and reported as Term Work

1. Draw a communication cycle showing all the elements.
2. Convert the verbal and numerical data into the suitable nonverbal form.
3. Listen to the presentation by the faculty or student and make running notes.
4. Listen to the pre-recorded conversation and answer the questions based on it. (Ref. IELTS: Book 1: CD: 1 and 2.)
5. Read the given passage and answer the questions following it. (Ref. Books for CAT or IELTS)
6. Introducing yourself (3 to 5 minutes)
7. Presentation for minimum 5 minutes on the given topic. (Current Issues or Technical Topics)

8. Situational English (Dialogues and Role-plays)
9. Group Discussion: Live Session
10. Mock-interview: Demo by expert panel.
11. Drafting: i) Business Letter, ii) Resume

Text Books:

1. Developing Communication Skills Mohan, Krishna.Meera Banerji, New Delhi Macmillan
2. Communication Skills for Effective Management, DR. Anjali Ghanekar, Everest Publishing House.
3. Communication Skills for Engineers, Sunita Mishra and C. Muralikrishna, Pearson Education.
