



DUMKA ENGINEERING COLLEGE

(Estd by **Govt. of Jharkhand** and Run by **Techno India** Under PPP)

Dumka, Jharkhand-814101

(Affiliated To Jharkhand University Of Technology, Ranchi)



Jharkhand University of Technology Jharkhand, Ranchi

Proposed Syllabus for B.Tech 3rd Semester

Electrical Engineering

&

Electrical and Electronics Engineering

Electrical Engineering

3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	EE301	Electrical Machine-I	3	1	0	3
02	EE302	Network Theory	3	1	0	3
03	EE303	Electromagnetic Field Theory	3	1	0	3
04	EC301	Basic Electronics	3	1	0	3
05	BSC301	Mathematics-III	3	1	0	4
06	BSC302	Environmental Science	2	0	0	0
01	EE301P	Electrical Machine-I Lab	0	0	3	1
02	EE302P	Network Theory Lab	0	0	3	1
03	EC301P	Basic Electronics Lab	0	0	3	1
04	EX301	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1
Total credit						21

Electrical and Electronics Engineering

3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	EE301	Electrical Machine-I	3	1	0	3
02	EE302	Network Theory	3	1	0	3
03	EE303	Electromagnetic Field Theory	3	1	0	3
04	EC301	Basic Electronics	3	1	0	3
05	BSC301	Mathematics-III	3	1	0	4
06	BSC302	Environmental Science	2	0	0	0
01	EC301P	Basic Electronics Lab	0	0	3	1
02	EE301P	Electrical Machine-I Lab	0	0	3	1
03	EE302P	Network Theory Lab	0	0	3	1
04	EX301	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1
Total credit						21



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MATHEMATICS III

(COMMON FOR ALL BRANCH)

Course code –BSC- 301

L	T	P	CR.
3	1	0	4

Module I

Laplace Transformation: Laplace Transformation and its applications, Inverse Laplace Transformation, Convolution Theorem, Solution of ODE by Laplace Transformation.

Module II

Fourier Transform: Complex form of Fourier series, Fourier Transformation and inverse Fourier Transformation, sine, cosine Transformation, Inverse Transformations -simple illustration.

Module III

Z-Transform: Inverse Z-Transform- Properties – Initial and final value theorems- convolution theorem- Difference equations, Solution of Difference equations using Z-Transformation.

Module IV

Partial Differential Equations: Solution of Wave equation, Heat equation, Laplace's equation by the method of separation of variables and its applications. Solution of PDE by Laplace Transformation.

Module V

Numerical Method: Finite difference, Symbolic relations, Interpolation and Extrapolation, Newton – Gregory forward and backward formula, Gauss forward and backward formula, Lagrange's formula, Inverse Interpolation by Lagrange's formula, Numerical Differentiation and Numerical Integration : Trapezoidal rule, Simpson's $1/3^{\text{rd}}$ rule, Simpson's $3/8^{\text{th}}$ rule, Weddle quadrature formula.

Text Books

- Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
- Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 2010.
- B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition.

Reference Books



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- R. J. Beerends ,H. G. Ter Morsche ,J. C. Van Den Berg, E. M. Van De Vrie, Fourier and Laplace Transforms, Cambridge University Press.
 - Sastry S.S, Introductory Methods of Numerical Analysis, PHI.
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BASIC ELECTRONICS

(ECE, EEE, EE,CSE, IT)

Course code -EC 301

L T	P	CR.
3 1	0	3

Module I: Basic Electronic Components

Active and Passive Components, Types of resistors and Colour coding, Capacitors, Inductors applications of Resistor, Capacitor and Inductor, Relay, LDR, Basic Integrated Circuits (IC 7805, 7809, 7812, 555 etc.).Measuring Instruments like CRO, Power supply, Multi-meters etc.

Module II: Semiconductors

Difference between Insulators, Semiconductors and Conductors, Mobility and Conductivity, Intrinsic and Extrinsic Semiconductors, Fermi Level, Energy band, Charge Densities in Semiconductors, Mass Action Law, Current Components in Semiconductors, Drift and Diffusion Current, The Continuity Equation, Injected Minority Charge Carrier, Hall Effect, P-N Junction Diode, construction, working, characteristics and diode equation Application of Diode, Rectifier: Half Wave, Full Wave and Bridge Rectifier, Zener Diode and its Applications, Varactor Diode, Schottky Diode, Regulated Power Supply using Zener Diode and Regulated ICs, LED, Photodetector.

Module III: Transistors

Construction, Working, Modes and Configuration of BJT, Input and Output Characteristics of all Configurations, Comparison of all Configuration & Modes, BJT as a Switch and as an Amplifier. JFET Construction, working and characteristics. MOSFET Construction, working and Characteristics, Types of MOSFET.

Module IV: Power electronic devices &Communication engineering

Construction, characteristics and working of SCR, DIAC, TRIAC and UJT. Introduction, Characteristics and applications of Operational Amplifier (Ic741). Modulation and its types.



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Module V: Digital Logic and basic circuit Design

Number systems and conversion (DECIMAL, OCTAL, HEXADECIMAL, BINARY, BCD etc.), binary addition and subtraction, Logic Gates and their truth-table, Boolean algebra. Design

of Single Stage Amplifier, LED Driver Circuit, Infrared Transmitter Receiver Circuit, LDR Driver Circuit, Relay Driver Circuit, Square Wave and Fix Frequency Generator using 555 IC.

Text Books

1. Basic Electronics and Linear Circuits by N. N. Bhargava, D. C. Kulshreshtha and S. C. Gupta, TMH Publications.
2. Op-Amps and Linear Integrated Circuits by Ramakant A. Gayakwad, PHI Publications.
3. Electronic Devices and Circuits by Godse and Bakshi Technical, Vol-1 Technical Publication Pune.

Reference Books

1. Integrated Devices & Circuits by Millman & Halkias, TMH Publications.
 2. Electronics Devices and Circuit Theory by R. Boylestad & L. Nashelsky, Pearson Publication
 3. Electronic Communication System by G. Kennedy, TMH Publications.
 4. Basic Electronics by Sanjeev Kumar & Vandana Sachdeva, Paragaon International Publication
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ELECTRICAL MACHINES-I

(EEE, EE,)

Course code -EE 301

L T P CR.

3 1 0 3

Module I: Review of Magnetic circuits and Electro-mechanical Energy Conversion

MMF, flux, reluctance, inductance; review of Ampere Law and Biot Savart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil. Magnetic Materials, BH



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characteristics, Review of magnetic system, Energy in Magnetic system, Force and torque in magnetic field system, Energy balance equation, Energy conversion via electrical field, Energy in a singly excited system, Determination of the Force and Torque from energy and co-energy.

Module II: Single Phase Transformers and Autotransformers

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests,

comparison with two winding transformers.

Module III: Three Phase Transformers

Concept of Three-phase connections – Star/Delta. Construction of Three phase transformer, open delta connection, phasor groups, 3-phase to 2-phase and 3-phase to 6-phase connections with their applications, Three winding transformers. parallel operation and load sharing of single phase and three phase transformers. Tap-changing transformers, No-load and on-load tap-changing of transformers, three-winding transformers, Cooling of transformers.

Module IV: DC machines

Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation – Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.

Module V: DC machine - motoring and generation

Armature circuit equation for motoring and generation, Types of field excitations – separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines.

Text Books:

1. IJ Nagrath & D.P. Kothari, "Electrical Machines", Tata McGraw Hill
2. Rajendra Prasad, "Electrical Machines", PHI
3. PS Bimbhra, "Electrical Machinery", Khanna Publisher
4. AE Fitzgerald, C. Kingsley Jr and Umans, "Electric Machinery", McGraw Hill, International Student Edition.

Reference Books:



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1. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBSPublishers, 2004.
 2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
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NETWORK THEORY

(ECE, EEE, EE)

Course code -EE 302

L	T	P	CR.
3	1	0	3

Module I: Circuit Fundamentals

Voltage sources, Current sources, Conversion of voltage sources to current sources and vice versa. Network terminology :- Node, Junction, Branch, Loop, Network solution by branch current method, Loop or Mesh current method, Node voltage method, Star delta connection and conversion. Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactance's, source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC, circuits. Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.

Module II: Resonance Circuits

Series resonance circuit, Frequency response of a series resonant circuit, Q factor, Bandwidth, selectivity, Effect of Q on bandwidth and selectivity, Relation between bandwidth and Q, Impedance of a series resonant circuit, Resonance by variation of L and C, Parallel resonant circuit and effect of resistance of a capacitance, Frequency response of parallel resonant circuit.

Module III: Two- Port Network

Two- port network parameters, r, y, z, h, A B C D relation between the parameters, Inter-conversion of two port networks, cascade connection series connection, series parallel connection, T and M network representation of a two port network.

Module IV: NETWORK FUNCTIONS

Laplace transform, Transform of a voltage and current, Transform of circuit elements, Network functions, Poles and zeros of the network functions, Pole zero plot, Physical significance of poles and zeroes, Stability, Two-port network parameters in the frequency domain Transient response:
- step input response in RL circuit, step input response in R-C circuit, step input response in R-L-C circuit, ac transients.



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Module V: FILTERS and ATTENUATORS

Definitions, classification and characteristics of different filters, filter fundamentals such as attenuation constant(α), phase shift (β), propagation constant (γ), characteristic impedance (Z_0), decibel, neper. Design and analysis of constant K, M derived and composite filters (low pass, high pass, band pass, and band stop filters): T and PI sections. Definitions polarity test, back-to-back test, Autotransformers - construction, principle, applications and , classification, relation between neper and decibel, analysis and design of T type, PI type, alpha lattice, bridged –T and L types attenuators.

Text Books:

1. "A.Sudhakar, Shymmohan S. Palli, _Circuit and Network – Analysis and Synthesis‘, 3 rd Edition, Tata McGraw Hill Publication.
2. Van, Valkenburg; “Network analysis”; Prentice hall of India, 2000.
3. A. Chakrabarti, _Circuit theory (Analysis and Synthesis)‘, IIIrd edition, Dhanpat Rai and Co.

Reference Books:

1. D. Roy Choudhuri, _Networks and Systems‘, New Age International Publisher.
2. M.E.Van Valkenburg Network Analysis‘, IIIrd edition, Pearsons Education/PHI.
3. Josheph Edministrar, _Theory and Problems of Electronic Circuit (Schaum’s Series) – Tata McGraw Hill Publication.
4. Soni Gupta, _Electrical Circuit Analysis‘, Dhanpat Rai and Co.
5. Boylestad, _Introductory Circuit Analysis‘, Universal Book Stall, New

ELECTROMAGNETIC FIELD THEORY

(ECE, EEE, EE)

Course code -EE 303

L T	P	CR.
3 1	0	3

Module I: Coordinate Systems and Transformation:

Basics of Vectors: Addition, subtraction and multiplications; Cartesian, Cylindrical, Spherical transformation. Vector calculus: Differential length, area and volume, line surface and volume integrals, Del operator, Gradient, Divergence of a vector, Divergence theorem, Curl of a vector, Stokes’s theorem, Laplacian of a scalar.

Module II: Electrostatic fields:

Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gauss’s Law- Maxwell’s equation, Electric dipole and flux line, Energy density in electrostatic fields, Electric field in material space: Properties of materials, convection and conduction



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currents, conductors, polarization in dielectrics, Dielectric-constants, Continuity equation and relaxation time, boundary conditions, Electrostatic boundary value problems: Poisson's and Laplace's equations., Methods of Images.

Module III: Magneto Statics:

Magneto-static fields, Biot - Savart's Law, Ampere's circuit law, Maxwell's equation, Application of ampere's law, Magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential.

Module IV: Magnetic Forces:

, a magnetic dipole. Magnetization in materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy.

Module V: Waves and Applications:

Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, Displacement current, Maxwell's equation in final form Electromagnetic wave propagation: Wave propagation in loss dielectrics, Plane waves in lossless dielectrics Plane wave in free space. Plain waves in good conductors, Power and the pointing vector, Reflection of a plain wave in a normal incidence. Transmission Lines, and Smith Chart.

Text Book:

1. MNO Sadiku, "Elements of Electromagnetic", Oxford University Press.

Reference Books:

1. WH Hayt and JA Buck, "Engineering Electromagnetic", McGraw- Hill Education.
2. Antenna and wave propagation by k.d parsad satya prakashan.

ENVIRONMENTAL SCIENCE

Course code – BSC 302

L T P CR.

2 0 0 0

(COMMON FOR ALL BRANCH)

Module-1

Concept and scope of Environment science, components of environment, environmental segment and their importance. (2 Hrs)

Module-II



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Ecology: Ecosystem and its characteristics features, structure and function of forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem, ecological balance and consequences of imbalance. (4 Hrs)

Module-III

Atmosphere: Atmospheric composition, energy balance, climate, weather, depletion of ozone layer, green house effect, acid rain, particles, ions and radicals in the atmosphere, chemical and photochemical reactions in the atmosphere.

Module-IV

(4 Hrs)

Air pollution and control: Air pollutants, sources and effect of air pollutants, primary and secondary pollutants, photochemical smog, fly ash, inorganic and organic particulate matter. Air quality standards, sampling, monitoring and control measures for pollutants.

(4 Hrs)

Module-V

Water pollution and control: Aquatic environment, water pollution, sources and their effect, lake and ground water pollution, eutrophication, water quality standard and water pollution control measures, waste water treatment.

Module-VI

(4 Hrs)

Land pollution; Lithosphere, composition of soil, acid base and ion exchange reactions in soil, soil erosion, landslides, desertification, pollutants (municipal, industrial, commercial, agricultural , hazardous solid wastes), origin and effects, collection and disposal of solid wastes, recovery and conversion methods. (5 Hrs)

Module-VII

Noise pollution; Noise classification and its sources, effects and measurement, noise pollution hazards, standards and noise pollution control. (2 Hrs)

Books and References:

1. Master, G.M Introduction to environment engineering and science, Pearson Education.
2. Nebel, B.J., Environment science, Prentice Hall Inc.
3. Odum, E.P. Ecology: The link between the natural and social sciences. IBH Publishing Company Delhi
4. De, A.K. Environmental Chemistry, Merrut.



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5. Sharma B.K Environmental Chemistry, Krishna Prakashan Media Merrut.
 6. Kaushik, A and Kaushik, C.P. Perspectives in Environmental studies, New Age International Publication.
 7. Menon, S.E. Environmental Chemistry.
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BASIC ELECTRONICS LAB

(ECE, EEE, EE)

Course code -ECE 301P

List of Experiments (Minimum 10)

1. Identification and testing of Resistors, Inductors, Capacitors, PN-Diode. Zener Diode, LED, LCD, LDR, BJT, Photo Diode, Photo Transistor,
2. Measurement of voltage and current using multimeter ,Measure the frequency and Amplitude of a signal with the help of CRO and function generator.
3. Study of p-n junction diode AND Zener Diode I-V characteristics
4. Assemble the single phase half wave and full wave bridge rectifier & the analyze effect of capacitor as a filter(only study of waveforms).
5. Study of Zener diode as voltage regulator.
6. Measurement & study of input characteristics of a BJT in CB configuration.
7. Measurement and study of characteristics of JFET and MOSFET
8. To design and simulate IR Transmitter and Receiver Circuit.
9. To design and simulate Motor Driver using Relay.
10. To design and simulate Light detector using LDR.
11. To design and simulate Constant frequency square wave generator using.
12. To design and simulate 5 volt DC power supply from 230 AC.



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NOTE : *At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.*

ELECTRICAL MACHINE LAB-I

List of Experiments (Minimum 10)

1. To obtain the speed characteristics of a D.C shunt motor as a function of armature voltage, field current, and external resistance in the armature circuit.
2. To find the critical resistance (R_c) and critical speed (N_c) and O.C.C. of a dc shunt generator.
3. To conduct a load test on a dc shunt generator and obtain its internal and external characteristics.
4. To conduct load test on a dc series generator and to obtain its internal and external characteristics.
5. To perform Hopkinson's test on two similar DC shunt machines and obtain their efficiencies at various loads.
6. To separate the mechanical and iron losses (Retardation Test) of the given dc shunt machine.
7. To pre-determine the efficiency of a D.C shunt machine considering it as a motor by performing Swinburne's test on it.
8. To study about different types of DC motor starters.
9. To study power-sharing between two single-phase transformers operated in parallel.
10. To determine transformer winding polarity and explore the impact of connecting windings in series aiding and series opposing configurations.
11. To perform the short circuit and open circuit test of single-phase transformer and draw the equivalent circuit.
12. To determine Regulation and Efficiency of a single-phase transformer using direct loading test.

NOTE : *At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.*



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NETWORK THEORY LAB

(ECE, EEE, EE)

Course code -EE 302P

List of Experiments (Minimum 10)

1. Transient response of RC circuit.
 2. Transient response of RL circuit.
 3. To find the resonance frequency, Band width of RLC series circuit.
 4. To study and verify effect of R on frequency response of parallel resonance circuit.
 5. To calculate and verify "Z" parameters of a two port network.
 6. To calculate and verify "Y" parameters of a two port network.
 7. To determine equivalent parameter of parallel connections of two port network.
 8. To plot the frequency response of low pass filter and determine half-power frequency.
 9. To plot the frequency response of high pass filters and determines the half-power frequency.
 10. To plot the frequency response of band-pass filters and determines the band-width.
 11. To calculate and verify "ABCD" parameters of a two port network.
 12. To synthesize a network of a given network function and verify its response.
 13. Introduction of P-Spice or other simulation software
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COMMUNICATION SKILL LAB

Course code HS301



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This lab paper involves interactive practice sessions in Language Lab along with some class lectures to enable the students to be confident enough in language and professional sphere of life.

Module I: Listening Comprehension

To comprehend spoken material in standard Indian English/ British English & American English

- Current situation in India regarding English
- American English Vs. British English

Module II: Phonetics & Phonology

- Introduction to Phonetics & Phonology
- Organs of Speech/ Speech Mechanism
- Pronunciation, Intonation, Stress and Rhythm, Syllable division
- Consonants/Vowels/Diphthongs Classification

Module III: Common Everyday Situations: Conversations and Dialogues

Module IV: Communication at Workplace

Module V: Telephonic Conversation

- Introduction
- Listening/Speaking
- Problems of Telephonic Conversation
- Intensive Listening

Module VI: Interviews

- The Interview Process
- Purpose/Planning/Two-way Interaction/Informality
- Pre-interview Preparation Techniques
- Projecting a Positive Image
- Answering strategies

Module VII: Formal Presentations



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- Introduction
- Nature/Importance of Presentation
- Planning
- Objective with central idea, main ideas, role of supporting materials
- Handling Stage Fright

Module VIII: Forms of Technical Communication: Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Module IX: Technical Presentation: Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Module X: Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and non verbal means.



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Proposed Syllabus for B.Tech 4th Semester

Electrical Engineering

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Electrical and Electronics Engineering

Electrical Engineering

4th semester course structure

Sl. No.	Course code.	Subject	L	T	P	Credit
01	EE401	Power System – I	3	1	0	3
02	EE402	Measurement & Instrumentation	3	1	0	3
03	EC401	Analog Electronics And Circuits	3	1	0	3
04	EC403	Digital Electronics And Logic Design	3	1	0	3
05	CS301	Data Structure And Algorithm	3	1	0	3
06	EN401/ IT402	Engineering Economics /Cyber Security	2	0	0	0
01	EE401P	Power System- I Lab	0	0	3	1
02	EE402P	Measurement & Instrumentation Lab	0	0	3	1
03	EC403P	Digital Electronics And Logic Design Lab	0	0	3	1
04	EX401	Extra Activities (NSO/NSS/NCC/Yoga/ Creative Arts/Mini Project)	0	0	2	1
05	IN401	Internship/ Tour & Training/Industrial Training	0	0	0	2
Total credit						21



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POWER SYSTEM-1

Course Code- EE401

Module I: Basic Concepts:

Evolution of Power Systems and Present-Day Scenario. Structure of a power system: Bulk Power Grids and Micro-grids. Generation: Conventional and Renewable Energy Sources. Distributed Energy Resources. Energy Storage. Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radial systems). Synchronous Grids and Asynchronous (DC) interconnections. Review of Three-phase systems. Analysis of simple three-phase circuits. Power Transfer in AC circuits and Reactive Power.

Module II: Power System Components :

Overhead Transmission Lines and Cables: Electrical and Magnetic Fields around conductors, Corona. Parameters of lines and cables. Capacitance and Inductance calculations for simple configurations. Travelling-wave Equations. Sinusoidal Steady state representation of Lines: Short, medium and long lines. Power Transfer, Voltage profile and Reactive Power. Characteristics of transmission lines. Surge Impedance Loading. Series and Shunt Compensation of transmission lines. Transformers: Three-phase connections and Phase-shifts. Three-winding transformers, autotransformers, Neutral Grounding transformers. Tap-Changing in transformers. Transformer Parameters. Single phase equivalent of three-phase transformers. Synchronous Machines: Steady-state performance characteristics. Operation when connected to infinite bus. Real and Reactive Power Capability Curve of generators. Typical waveform under balanced terminal short circuit conditions – steady state, transient and sub-transient equivalent circuits. Loads: Types, Voltage and Frequency Dependence of Loads. Per-unit System and per-unit calculations.

Module III: Over-voltages and Insulation Requirements:

Generation of Over-voltages: Lightning and Switching Surges. Protection against Over-voltages, Overhead Line Insulators: Introduction, types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, testing of insulators. Insulation Coordination. Propagation of Surges. Voltages produced by travelling surges. Bewley Diagrams.

Module IV: Fault Analysis and Protection Systems :



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Method of Symmetrical Components (positive, negative and zero sequences). Balanced and Unbalanced Faults. Representation of generators, lines and transformers in sequence networks.

Computation of Fault Currents. Neutral Grounding. Switchgear: Types of Circuit Breakers. Attributes of Protection schemes, Back-up Protection. Protection schemes (Over-current, directional, distance protection, differential protection) and their application.

Module V: Introduction to DC Transmission & Renewable Energy Systems

DC Transmission Systems: Line-Commutated Converters (LCC) and Voltage Source Converters (VSC). LCC and VSC based dc link, Real Power Flow control in a dc link. Comparison of ac and dc transmission. Solar PV systems: I-V and P-V characteristics of PV panels, power electronic interface of PV to the grid. Wind Energy Systems: Power curve of wind turbine. Fixed and variable speed turbines. Permanent Magnetic Synchronous Generators and Induction Generators, Power Electronics interfaces of wind generators to the grid.

Text Books:

1. J. Grainger and W. D. Stevenson, "Power System Analysis", McGraw Hill Education, 1994.
2. O. I. Elgerd, "Electric Energy Systems Theory", McGraw Hill Education, 1995.
3. A. R. Bergen and V. Vittal, "Power System Analysis", Pearson Education Inc., 1999.
4. "C. L. Wadhawa", "Generation and utilization of Electrical Energy", New age International (P) Limited, Publishers 1997.
5. "C. L. Wadhawa", "Electrical Power Systems", New age International (P) Limited, Publishers 1997.
6. "M. L. Soni, P. V. Gupta, U. S. Bhatnagar and A. Chakraborti", "A Text Book on Power System Engineering", Dhanpat Rai and Co. Pvt. Ltd, 1999.

Reference Books :

1. D. P. Kothari and I. J. Nagrath, "Modern Power System Analysis", McGraw Hill Education, 2003.
2. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley, 2012.
3. "M.V. Deshpande", "Elements of Power Station design and practice", Wheeler Publishing, 3rd Edition 1999.
4. "S. N. Singh", "Electrical Power Generation, Transmission and Distribution", PHI, 2003.
5. "V.K Mehta and Rohit Mehta", "Principles of Power Systems", S. Chand & Company Ltd, New Delhi, 2004.



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MEASUREMENT AND INSTRUMENTATION

Course Code- EE402

Module I: Measuring System Fundamentals:

Absolute standards (International, Primary, Secondary, and Working standards), True Value, Errors (Gross, Systematic and Random); Static Characteristic of instruments (Accuracy, Precision, Sensitivity, Resolution and threshold). Classification of Instruments (based upon mode of measurement- Indicating, Recording and Integrating Instruments), Generalized Instrument (block diagram and description of various blocks), the three forces in an electromechanical indicating instrument (deflecting, controlling and damping forces and the interplay between them), Comparison between gravity and spring (Qualitative Study). Errors in Measurements. Basic statistical analysis applied to measurements: Mean, Standard Deviation, Six-sigma estimation, Cp, Cpk

Module II: Analog Ammeters, Voltmeters and Watt meters :

PMMC and MI Instruments, Construction, Torque Equation, Range Extension, Effect of temperature, Classification, Errors, Advantages and Disadvantages. Analog Wattmeters Power Factor Meters and Energy Meter Power and Power Factor, Electrodynamometer type wattmeter, power factor meter, Construction, theory, Shape of scale, torque equation, Advantages and disadvantages, active and reactive power measurement in single phase, Measurement in three phase. Single phase induction type energy meters, construction, theory, Operation, lag adjustments, Max Demand meters/indicators, Measurement of VAH and VARh.

Module III: DC and AC Bridges:

Measurement of resistance, Wheatstone Bridge, Kelvin's Bridge, Kelvin's Double Bridge, Measurement of inductance, Capacitance, Maxwell's Bridge, Desauty Bridge, Anderson Bridge, Schering Bridge, Wien Bridge, Applications and Limitations.

Module IV: Instrument Transformers and Transducers

Current Transformer and Potential Transformer - construction, theory, phasor diagram, errors, testing and applications. Measurement of Temperature, RTD, Thermistors, LVDT, Strain Gauge, Piezoelectric Transducers, Digital Shaft Encoders, Tachometer, Hall effect sensors. Sensors and



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Transducers for physical parameters: temperature, pressure, torque, flow. Speed and Position Sensors.

Module V: Electronic Instruments:

Electronic Display Device, Digital Voltmeters, Digital Energy meter, CRO, measurement of voltage and frequency, Lissajous Patterns, Plotting B-H curve of a magnetic material, Wave Analyzers, Harmonic Distortion Analyzer. Digital Energy Meter. Measurements of R, L and C. Digital Multi-meter, True RMS meters, Clamp-on meters, Meggers. Digital Storage Oscilloscope.

Text Books:

1. W.D. Coopers and Helfrick, Modern Electronic instrumentation and Measurements Techniques, Prentice Hall of India Pvt. Ltd,
2. E.W. Gowlding and F.C.Widdis, Electrical Measurements and Measuring Instruments 5/e, Wheeler Publications.
3. U. A. Bakshi, A. V. Bakshi: Electrical Measurements and Instrumentation, Technical Publications.

Reference Books

1. A. K. Sawhney: A course in Electrical Measurements Electronic Measurements Instrumentation, Edition 11, Dhanpat Rai and Sons,
2. J. B. Gupta: A course in Electrical and Electronic Measurements and Instrumentation, 13/E, Kataria and Sons.

ANALOG ELECTRONICS AND CIRCUITS

Course Code- EC401

Module I: Diode & Transistor Circuits:



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P-N junction diode, I-V characteristics of a diode, review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits. Amplifier models, Voltage amplifier, current amplifier, transconductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers, high-frequency equivalent circuits.

Module II: Oscillators, DAC & ADC:

Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. Digital-to-analog converters (DAC) Weighted resistor, R-2R ladder, resistor string etc., Analog to-digital converters (ADC): Single slope, dual slope, successive approximation, flash etc.

Module III: MOSFET circuits:

MOSFET structure and I-V characteristics, MOSFET as a switch, MOSFET as an amplifier: small signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit.

Module IV: Differential, multi-stage and operational amplifiers:

Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

Module V: Linear & Nonlinear applications of op-amp:

Idealized analysis of op-amp circuits, Inverting and non-inverting amplifier, Differential amplifier, Instrumentation amplifier, Integrator, Active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, Voltage regulator, Oscillators (Wein bridge and phase shift). Analog to Digital Conversion. Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators, Precision rectifier, peak detector, Monoshot.

Text Books :

1. A. S. Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University Press, 1998.



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2. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.
3. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.

Reference Books:

1. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
2. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001
3. Op-Amps and Linear Integrated Circuits by A. Gayakwad, Pearson Publication

Course code -EC 302

Module I: Binary Codes and Boolean algebra

Analog and Digital, Binary Number System. Addition, Subtraction, Multiplication, Division of binary numbers, Subtraction using 2's complement method. Binary codes: weighted and non weighted codes, self complementary codes, BCD, Excess-3, Gray codes, Alphanumeric codes, ASCII Codes. *Boolean algebra*: Boolean Laws and Expression using Logic Gates, Realization of different gates using Universal gates, DeMorgan's Theorem, Duality Theorems.

Module II : Boolean function minimization Techniques

Standard forms: SOP, POS, Simplification of Switching function & representation (Maxterm & Minterm), Boolean expression & representation using logic gates, Propagation delay in logic gate. *Karnaugh map*: K-map(up to 5 variables), mapping and minimization of SOP and POS expression, Don't care condition, conversion from SOP to POS and POS to SOP form using K-map, Minimization of multiple output circuits, Quine Mc-cluskey method minimization technique, prime implicant table, Don't care condition.

Module III: Combinational Circuits Design

Adder & Subtractor (Half and Full), Parallel Binary adder, BCD Adder, Binary multipliers, Code Converters, parity bit generator, Comparators, Decoder, BCD to 7-segment Decoder, Encoders, Priority Encoders, Multiplexers, De Multiplexers.

Module IV : Sequential Circuits Elements



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Introduction to sequential circuit, Flip-flop & Timing Circuits: SR latch, Gated latch, Tri state logic, Edge triggered flip-flop: - D, JK, T Flip-flop, flip-flop asynchronous inputs, characteristic table of Flip-flop, excitation table of Flip-flop, master slave JK flip flop, inter conversion of Flip-flop. Study of timing parameters of flip-flop. Shift registers: buffer register, controlled buffer register. Data transmission in shift resistor SISO, SIPO, PISO, PIPO, Bidirectional shift register, universal shift registers. *Counter*: Classification, Ripple or asynchronous counter, Effect of propagation delay in ripple counters, up-down counter,

Design of Mod-n counter, synchronous counter, Ring counter, Johnson counter. Introduction to FSM. Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator.

Module V: Logic Families and VLSI Design flow

Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA, Logic implementation using Programmable Devices VLSI Design flow: Design entry, Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits

Text Books :

1. Kharate "Digital Electronics" OXFORD Publication
2. A. Anand Kumar 'Fundamentals of Digital Circuits'. PHI Publications
3. R.P. Jain-'Modern Digital Electronics' IIIrd Edition- Tata Mc Graw Hill, Publication
4. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition
6. Bhaskar VHDL BASED DESIGN, PEARSON EDUCATION

Reference Books:

1. Rajkamal 'Digital Systems Principals and Design' Pearson Education
2. A.P. Malvino, D.P. Leach 'Digital Principles & Applications' -VIth Edition-TMH publication.
3. M. Morris Mano 'Digital Design' (Third Edition). PHI Publications



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DATA STRUCTURES AND ALGORITHMS

Course code -CS 301

Module I

Basic concepts and notations: Data structures and data structure operations, Complexity Analysis: Mathematical notation and functions, algorithmic complexity and time space trade off, Big O Notation, The best, average & worst cases analysis of various algorithms. Arrays: Linear & Multidimensional Arrays, Representation & traversal. Sorting algorithms: Bubble sort,

Selection sort, Insertion sort, Merge sort and Quick sort, Counting Sort. Linear search and Binary search on sorted arrays.

Module II

Abstract Data Types (ADTs) Stack: Push; Pop, stack representation using array and linked list, Applications of Stack, Recursion. Queue: Representation using array and linked list, Insertion and deletion operations, circular queue, Dequeue, priority queue. Linked Lists & their types.

(Single, Double, Circular linked lists), Operations on Varieties of Linked Lists (Search and Update) with applications

Module III

Introduction to Trees, Binary tree - definitions and properties; binary tree traversal algorithms with and without recursion., Binary Search Tree - creation, insertion and deletion operations, Threaded tree (One way and Two way). AVL tree balancing; B-tree

Module IV

Graph Algorithms: Graphs and their Representations, Graph Traversal Techniques: Breadth First Search (BFS) and Depth First Search (DFS), Applications of BFS and DFS, Minimum Spanning Trees (MST), Prim's and Kruskal's algorithms for MST, Connected Components, Dijkstra's Algorithm for Single Source Shortest Paths,, Floyd's Algorithm for All-Pairs Shortest Paths Problem

Module V



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Hashing techniques, Hash function, Address calculation techniques- common hashing functions Collision resolution, Linear probing, quadratic probing, double hashing, Bucket addressing. Rehashing

Course Outcomes: At the end of the course the student will be able to:

- Understand the concept of ADT
- Identify data structures suitable to solve problems
- Develop and analyze algorithms for stacks, queues
- Develop algorithms for binary trees and graphs
- Implement sorting and searching algorithms
- Implement symbol table using hashing techniques

Text Books:

1. Data Structures Using C – A.M. Tenenbaum (PHI)
2. Introduction to Data Structures with Applications by J. Tremblay and P. G. Sorenson (TMH)
3. Data Structures, Algorithms and Application in C, 2nd Edition, Sartaj Sahni
4. Data Structures and Algorithms in C, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.

REFERENCE BOOKS:

1. Data Structure and Program Design in C by C.L. Tondo.
2. Data Structures with C++, J. Hubbard, Schaum's Outlines, TMH.
3. Data Structures and Algorithms in C, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.
4. Data Structures and Algorithm Analysis in C, 3rd Edition, M.A. Weiss, Pearson.
5. Classic Data Structures, D. Samanta, 2nd Edition, PHI.
6. Data Structure Using C by Pankaj Kumar Pandey.
7. Data Structure with C, Tata McGraw Hill Education Private Limited by Seymour Lipschutz.
8. Data Structure through C in Depth, BPB Publication, by S.K. Srivastava.
9. Data Structure and algorithm Analysis in C 2nd Edition, PEARSON Publishing House,



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Mark Allen Weiss

CYBER SECURITY

Course code –IT 402

Module I: Introduction to Cybercrime : Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, and Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

Module II: Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

Module III: Cybercrime : Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops

Module – IV: Tools and Methods Used in Cybercrime : Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

Module V: Cyber Security : Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOK:

- Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

REFERENCE BOOK:

- Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.



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- Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group

ENGINEERING ECONOMICS

Course code –EN 401

COURSE OUTLINE:

The basic purpose of this course is to provide a sound understanding of concepts and principles of engineering economy and to develop proficiency with methods for making rational decisions regarding problems likely to be encountered in professional practice.

Module -1

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Nature of Economic problem, Production possibility curve, Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its practical application and importance.

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Module -II

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Various concepts of cost – Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost. Shape of average cost, marginal cost, total cost, Cost curves.

Module III

Meaning of Market, Types of Market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Pricing Policies- Entry Deterring policies, Predatory Pricing, Peak load Pricing. Product Life cycle



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Firm as an organisation- Objective of the Firm, Type of the Firm, Vertical and Horizontal Integration, Diversification, Mergers and Takeovers.

Module -IV

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization – meaning, merits and demerits. Globalisation of Indian economy – merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement, Business cycle, Inflation

RECOMMENDED BOOKS:-

1. R.Paneer Seelvan: Engineering Economics, PHI
2. Managerial Economics, D.N.Dwivedi, Vikash Publication
3. Managerial Economics, H.L. Ahuja, S. Chand and Co. Ltd.
4. Managerial Economics, Suma Damodaran, Oxford.
5. R.molrishnd Ro T.V S 'Theory of firms : Economics and Managerial Aspects'. Affiliated East West Press Pvt Ltd New Delhi
6. Managerial Economics, H. Craig Petersen &W. Cris Lewis, Pearson Education.



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2nd year UG

Engg & Tech.

Jharkhand University Of Technology

POWER SYSTEM-1 LAB

Course Code- EE401

List of Experiments (Minimum 10)

1. To draw operating characteristics of DMT/IDMT relay.
2. To draw operating characteristics of differential relay.
3. To study Bucholtz Relay.
4. Testing of Transformer oil.
5. To find ABCD Parameters of a model of transmission line.
6. To observe Ferranti effect in a model of transmission line.
7. To study the microcontroller based differential relay for the protection of transformer.
8. To study electromechanical type negative sequence relay.
9. To study electromechanical type over current relay.
10. To study electromechanical type directional over current relay.
11. To study electromechanical type earth fault relay.
12. To determine the string efficiency of suspension type insulators with and without guard ring.
13. To plot Annual / monthly / daily load demand of nearby area.
14. To draw single line diagram of distribution system of JUVNL of nearby area of college concerned.

NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.



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MEASUREMENT AND INSTRUMENTATION LAB

Course Code- EE402

List of Experiments (Minimum 10)

1. Calibration of AC voltmeter and AC ammeter.
2. Measurement of inductance using Maxwell's Bridge.
3. Measurement of capacitance using Schering Bridge.
4. Measurement of low resistance using Kelvin's Double Bridge.
5. Measurement of Power using CT and PT.
6. Measuring displacement using LVDT.
7. Measuring temperature using thermocouple.
8. Measuring pressure using piezoelectric pick up.
9. Measurement of speed of DC motor by photoelectric pick up.
10. Speed measurement using Hall Effect sensor.
11. Measurement of a batch of resistors and estimating statistical parameters.
Measurement of L using a bridge technique as well as LCR meter.
12. Measurement of C using a bridge technique as well as LCR meter. Measurement of Low Resistance using Kelvin's double bridge.

NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.



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DIGITAL ELECTRONICS AND LOGIC DESIGN LAB

Course code EC 302P

List of Experiments (Minimum 10)

1. Study of TTL gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Design & realize a given function using K-maps and verify its performance.
3. To verify the operation of multiplexer & Demultiplexer.
4. To verify the operation of comparator.
5. To verify the truth tables of S-R, J-K, T & D type flip flops.
6. To verify the operation of bi-directional shift register.
7. To design & verify the operation of 3-bit synchronous counter.
8. Design all gates using VHDL.
9. Design a multiplexer using VHDL
10. Design a decoder using VHDL
11. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. half adder b. full adder
12. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. multiplexer b. demultiplexer

NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus. For VHDL Xilinx software may be used.
