JHARKHAND Rai University

Jharkhand Rai University

ELECTRICAL ENGINEERING

B.Tech

SYLLABUS

2018-2022

SEMESTER V

Kamre|RatuRoad|Ranchi |Jharkhand

Web:www.jru.edu.in|Email: Info@jru.edu.in

Semester V
Choice Based Credit System

S.NO	Category	Code	Subject Title	Periods			Evaluation Scheme				Subject	Credit
				L	T	P	Assign	TA	Total	ESE	Total	
1	Professional Core Courses	6PCCEE301	Power System I (Apparatus & modelling)	3	0	0	20	10	30	70	100	3
2	Professional Core Courses	6PCCEE302	Control system	3	0	0	20	10	30	70	100	3
3	Professional Core Courses	6PCCEE303	Electrical Machine-II	3	0	0	20	10	30	70	100	3
4	Professional Core Courses	6PCCEE304	Microprocessors	3	0	0	20	10	30	70	100	3
5	Departmental Elective Courses		**Departmental Elective I**	3	0	0	20	10	30	70	100	3
6	Open Elective Cources		**Open Elective I**	3	0	0	20	10	30	70	100	3
7	Mandatory Courses	MC301	**Constitution of India	2	0	0	20	10	30	70	100	0
8	Humanities & social sciences including Management cources	HSMC301	**Professional skill	2	0	0	20	10	30	70	100	0
PRACTICAL/DEMONSTRATION												
1	Professional Core Courses	6PCCEE301P	Power system I Lab	0	0	2	0	0	30	20	50	1
2	Professional Core Courses	6PCCEE302P	Control system Lab	0	0	2	0	0	30	20	50	1
3	Professional Core Courses	6PCCEE303P	Electrical Machines -II Lab	0	0	2	0	0	30	20	50	1
4	Professional Core Courses	6PCCEE304P	Microprocessors Lab	0	0	2	0	0	30	20	50	1
									TOTAL		**800**	**22**

Programme:B.Tech

Semester: V

Course: Power System I (Apparatus& Modelling)

Course Code: 6PCCEE301

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the concepts of power systems.
- Understand the various power system components.
- Evaluate fault currents for different types of faults.
- Understand the generation of over-voltages and insulation coordination.
- Understand basic protection schemes.
- Understand concepts of HVDC power transmission and renewable energy generation.

Module 1: Basic Concepts (4 hours)

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 2: Power System Components (15 hours)

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 3: Over-voltages and Insulation Requirements (4 hours)

Generation of Over-voltages: Lightning and Switching Surges. Protection against over voltages, Insulation Coordination. Propagation of Surges. Voltages produced by traveling surges. Bewley Diagrams.

Module 4: Fault Analysis and Protection Systems (10 hours)

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 5: Introduction to DC Transmission & Renewable Energy Systems (9 hours)

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/References:

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. D. P. Kothari and I. J. Nagrath, “Modern Power System Analysis”, McGraw Hill Education, 2003.

5. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, “Electric Power Systems”, Wiley, 2012.

JHARKHAND Rai University

Programme: B.Tech

Semester: V

Course: Control system

Course Code: 6PCCEE302

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

- Understand the modeling of linear-time-invariant systems using transfer function and state-space representations.
- Understand the concept of stability and its assessment for linear-time invariant systems.
- Design simple feedback controllers.

Module 1: Introduction to control problem (4 hours)

Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control:Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.

Module 2: Time Response Analysis (10 hours)

Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

Module 3: Frequency-response analysis (6 hours)

Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

Module 4: Introduction to Controller Design (10 hours)

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

Module 5: State variable Analysis (6 hours)

Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.

Module 6: Introduction to Optimal Control and Nonlinear Control(5 hours)

Performance Indices. Regulator problem, Tracking Problem. Nonlinear system–Basic concepts and analysis.

Text/References:

1. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997.
2. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.
3. K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991.
4. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009

Programme: B.Tech

Semester: V

Course: Electrical Machine- II

Course Code: 6PCCEE303

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the concepts of rotating magnetic fields.
- Understand the operation of ac machines.
- Analyze performance characteristics of ac machines.

Module 1: Fundamentals of AC machine windings (8 Hours)

Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, 3D visualization of the above winding types, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, Sinusoidally distributed winding, winding distribution factor.

Module 2: Pulsating and revolving magnetic fields (4 Hours)

Constant magnetic field, pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding - fixed current and alternating current Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field.

Module 3: Induction Machines (12 Hours)

Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors. Generator operation. Self-excitation. Doubly-Fed Induction Machines.

Module 4: Single-phase induction motors (6 Hours)

Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and applications

Module 5: Synchronous machines (10 Hours)

Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation. Operating characteristics of synchronous machines, V-curves. Salient pole machine – two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division.

Text/References:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
4. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
5. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
6. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons,

JHARKHAND Rai University

Programme: B.Tech

Semester: V

Course: Microprocessors

Course Code: 6PCCEE304

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Do assembly language programming.
- Do interfacing design of peripherals like I/O, A/D, D/A, timer etc.
- Develop systems using different microcontrollers.

Module 1: Fundamentals of Microprocessors: (7Hours)

Fundamentals of Microprocessor Architecture. 8-bitMicroprocessor and Microcontroller architecture, Comparison of 8-bit microcontrollers, 16-bit and 32-bitmicrocontrollers. Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems. Overview of the 8051 family.

Module 2:The 8051 Architecture (8 Hours)

Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

Module 3: Instruction Set and Programming (8 Hours)

Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs. Assemblers and compilers. Programming and
Debugging tools.

Module4: Memory and I/O Interfacing (6 Hours):

Memory and I/O expansion buses, control signals, memory wait states. Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC, timers, counters, and memory devices.

Module 5: External Communication Interface (6 Hours)

Synchronous and Asynchronous Communication. RS232, SPI, I2C. Introduction and interfacing to protocols like Blue-tooth and Zig-bee.

Module6: Applications (06 Hours)

LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, and sensor interfacing.

Text / References:

1. M. A.Mazidi, J. G. Mazidi and R. D. McKinlay, "The8051Microcontroller and Embedded Systems: Using Assembly and C",Pearson Education, 2007.

2. K. J. Ayala, "8051 Microcontroller", Delmar Cengage Learning, 2004.

3. R. Kamal, "Embedded System", McGraw Hill Education, 2009.

4. R. S. Gaonkar, ", Microprocessor Architecture: Programming and Applications with the 8085", Penram International Publishing, 1996

JHARKHAND Rai University

Programme: B.Tech

Semester: V

Course: Digital signal processing

Course Code: 6PECEE301

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Represent signals mathematically in continuous and discrete-time, and in the frequencydomain.
- Analyse discrete-time systems using z-transform.
- Understand the Discrete-Fourier Transform (DFT) and the FFT algorithms.
- Design digital filters for various applications.
- Apply digital signal processing for the analysis of real-life signals.

Module 1: Discrete-time signals and systems (6 hours)

Discrete time signals and systems: Sequences; representation of signals on orthogonal basis; Representation of discrete systems using difference equations, Sampling and reconstruction of signals - aliasing; Sampling theorem and Nyquist rate.

Module 2: Z-transform (6 hours)

Z-Transform, Region of Convergence, Analysis of Linear Shift Invariant systems using Z-transform, Properties of z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.

Module 2: Discrete Fourier Transform (10 hours)

Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Convolution of signals, Fast Fourier Transform Algorithm, Parseval's Identity, Implementation of Discrete Time Systems.

Module 3: Design of Digital filters (12 hours)

Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Low-pass, Band-pass, Band-stop and High-pass filters.

Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multi-rate signal processing.

Module 4: Applications of Digital Signal Processing (6 hours)

Correlation Functions and Power Spectra, Stationary Processes, Optimal filtering using ARMA Model, Linear Mean-Square Estimation, Wiener Filter.

Text/Reference Books:

1. S. K. Mitra, "Digital Signal Processing: A computer based approach", McGraw Hill, 2011.

2. A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall, 1989.

3. J. G. Proakis and D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms And Applications", Prentice Hall, 1997.

4. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing", Prentice Hall, 1992.

5. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1992.

6. D. J. DeFatta, J. G. Lucas andW. S. Hodgkiss, "Digital Signal Processing", John Wiley & Sons, 1988.

JHARKHAND Rai University

Programme: B.Tech

Semester: V

Course: Digital Control system

Course Code: 6PECEE302

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Obtain discrete representation of LTI systems.
- Analyse stability of open loop and closed loop discrete-time systems.
- Design and analyse digital controllers.
- Design state feedback and output feedback controllers.

Module 1: Discrete Representation of Continuous Systems (6 hours)

Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modelling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.

Module 2: Discrete System Analysis (6 hours)

Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system.

Module 3: Stability of Discrete Time System (4 hours)

Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of digital control system with dead beat response. Practical issues with dead beat response design.

Module 4: State Space Approach for discrete time systems (10 hours)

State space models of discrete systems, State space analysis. Lyapunov Stability. Controllability, reach-ability, Re-constructability and observability analysis. Effect of pole zero cancellation on the controllability & observability.

Module 5: Design of Digital Control System(8 hours)

Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator.

Module 6: Discrete output feedback control (8 hours)

Design of discrete output feedback control. Fast output sampling (FOS) and periodic output feedback controller design for discrete time systems.

Text/References:

1. K. Ogata, “Digital Control Engineering”, Prentice Hall, Englewood Cliffs, 1995.

2. M. Gopal, “Digital Control Engineering”, Wiley Eastern, 1988.

3. G. F. Franklin, J. D. Powell and M. L. Workman, “Digital Control of Dynamic Systems”, Addison-Wesley, 1998.

4. B.C. Kuo, “Digital Control System”, Holt, Rinehart and Winston, 1980.

JHARKHAND Rai University

Programme: B.Tech

Semester: V

Course: Power system dynamics & control

Course Code: 6PECEE303

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the problem of power system stability and its impact on the system.
- Analyse linear dynamical systems and use of numerical integration methods.
- Model different power system components for the study of stability.
- Understand the methods to improve stability.

Module 1: Introduction to Power System Operations (3 hours)

Introduction to power system stability. Power System Operations and Control. Stability problems in Power System. Impact on Power System Operations and control.

Module 2: Analysis of Linear Dynamical System and Numerical Methods (5 hours)

Analysis of dynamical System, Concept of Equilibrium, Small and Large Disturbance Stability. Modal Analysis of Linear System. Analysis using Numerical Integration Techniques. Issues in Modeling: Slow and Fast Transients, Stiff System.

Module 3: Modeling of Synchronous Machines and Associated Controllers (12 hours)

Modeling of synchronous machine: Physical Characteristics. Rotor position dependent model. D-Q Transformation. Model with Standard Parameters. Steady State Analysis of Synchronous Machine. Short Circuit Transient Analysis of a Synchronous Machine. Synchronization of Synchronous Machine to an Infinite Bus. Modeling of Excitation and Prime Mover Systems. Physical Characteristics and Models. Excitation System Control. Automatic Voltage Regulator. Prime Mover Control Systems. Speed Governors.

Module 4: Modeling of other Power System Components (10 hours)

Modeling of Transmission Lines and Loads. Transmission Line Physical Characteristics. Transmission Line Modeling. Load Models - induction machine model. Frequency and Voltage Dependence of Loads. Other Subsystems – HVDC and FACTS controllers, Wind Energy Systems.

Module 5: Stability Analysis (11 hours)

Angular stability analysis in Single Machine Infinite Bus System. Angular Stability in multi-machine systems – Intra-plant, Local and Inter-area modes. Frequency Stability: Centre of Inertia Motion. Load Sharing: Governor Droop. Single Machine Load Bus System: Voltage Stability. Introduction to Torsional Oscillations and the SSR phenomenon. Stability Analysis Tools:Transient Stability Programs, Small Signal Analysis Programs.

Module 6: Enhancing System Stability (4 hours)

Planning Measures. Stabilizing Controllers (Power System Stabilizers). Operational Measures-Preventive Control. Emergency Control.

Text/Reference Books

1. K.R. Padiyar, "Power System Dynamics, Stability and Control", B. S. Publications, 2002.

2. P. Kundur, "Power System Stability and Control", McGraw Hill, 1995.

3. P. Sauer and M. A. Pai, "Power System Dynamics and Stability", Prentice Hall, 1997.

JHARKHAND Rai University

Programme: B.Tech

Semester: V

Course: Electronic Devices

Course Code: 6OECEE301

L	T	P	C
3	0	0	3

Course Outcomes:
At the end of this course students will demonstrate the ability to

- Understand the principles of semiconductor Physics
- Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems

Module I:
Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors

Module II:
Generation and recombination of carriers; Poisson and continuity equation P-N junction characteristics, I-Vcharacteristics, and small signal switching models; Avalanche breakdown, Zener diode, Schottky diode

Module III:

Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model,MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell;

Module IV:

Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

Text /Reference Books:

1. G. Streetman, and S. K. Banerjee, “Solid State Electronic Devices,” 7th edition, Pearson,2014.
2. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley &Sons, 2006.
4. C.T. Sah, “Fundamentals of solid state electronics,” World Scientific Publishing Co. Inc, 1991.
5. Y. Tsividis and M. Colin, “Operation and Modeling of the MOS Transistor,” Oxford Univ.Press, 2011.

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JHARKHAND Rai University

Programme: B.Tech

Semester: V

Course: Analog & Digital Communication

Course Code: 6OECEE302

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of this course students will demonstrate the ability to

- Analyze and compare different analog modulation schemes for their efficiency and bandwidth
- Analyze the behavior of a communication system in presence of noise
- Investigate pulsed modulation system and analyze their system performance
- Analyze different digital modulation schemes and can compute the bit error performance

Module I:

Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

Module II:

Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation.

Module III:

Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM),Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.

Module IV:

Elements of Detection Theory, Optimum detection of signals in noise,Coherent communication with waveforms- Probability of Error evaluations. BasebandPulse Transmission- Inter symbol Interference and Nyquist criterion.Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying,Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.

Module V:

Digital Modulation tradeoffs. Optimum demodulation of digital signals over band-limited channels- Maximum likelihood sequence detection (Viterbi receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.

Text/Reference Books:

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.
4. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",JohnWiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004.
6. Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.

JHARKHAND Rai University

Programme: B.Tech

Semester: V

Course: Electrical Materials

Course Code: 6OECEE303

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of this course students will be able to:

1. Understand the concept of semiconductor
2. Understand the magnetic material
3. Understand the Insulation material
4. Understand the Concept of Polarization
5. Know types of conducting materials

Module I:

Conducting Material: Classification and main properties, High resistivity alloy: Constant Mangann,Nichrome, Electrochemical, properties of copper, Aluminum, steel tungsten, Molybdenum, Platinum, Tantalum, Niobium, Mercurry, Nickel, Titanum, Carbon, Lead, thermal, Bitmetals, thermocouple,materials, specific resistance, conductance, variation of resistance with temperature, super conductors.

Module II:

Semi Conductor Materials: General conception, variation of electrical conductivity, Elements having semiconductor properties, general application, hall effect, energy levels, conduction in semiconductors, Intrinsic conduction, impurity conduction, P and N type impurities, electrical change, Neutrality, Drift, Mobility current flow in semi conductors P-N junction formation by alloying, Elasing (forward and reverse) of P-n junction, Reverse separation current, Zener effect, Junction, capacitance, hall defects and hall coeffiecient.

Module III:

Magnetic Materials: Details of magnetic materials, relation between B.H. , soft and hard magnetic materials. Di-magnetic, Para magnetic and Ferromagnetic materials, electrical sheet steel, cast iron. Permanent magnetic materials. Dynamic and static hysteresis loop. Hysterisis loss, eddy current loss, Magnetisation, magnetic susceptibility, coercive force, core temperature, rectangular hysteresia loop, Magnet rest square loop core materials, iron silicon, Iron alloys.

Module IV:

Insulating Materials: General electrical mechanical and chemical properties of insulating material, Electrical characteristics volume and surface resistivity complex permitivity loss, and dielectric loss, equivalent circuits of an imperfect dielectric polarization and polarisability classification of dielectric.

Module V:

Mechanical Properties: Classification insulating materials on the basis of temperature rise. General properties of transformer oil, commonly used varnishes, solidifying insulating materials, resins, bituminous waxes, drying oils, Fibrous insulating materials, wood, paper and cardboard,

insulating textiles, varnished adhesive tapes, inorganic fibrous material and other insulating materials, such as mica, ceramic, bakelite, ebonite, glass, PVC, rubber, other plastic molded materials.

Text Books/References:

1. TTTI Madras; Electrical Engineering Materials; TMH.
2. Electrical Engineering Material s & Devices; John Allison ,TMH
3. Materials for Electrical Engineering: B.M. Tareev
4. Anderson; Di-Electrics :
5. Kortisky; Electrical Engineering Materials:
6. Indulkar and S. Thruvengadem; Electrical Engineering Materials; S. Chand

JHARKHAND Rai University

Programme: B.Tech

Semester: V

Course: Constitution of India

Course Code: MC301

L	T	P	C
2	0	0	0

Course Outcome:

The basic object of the course is to provide the acquaintance with the basic features of Indian Constitution e.g. Fundamental Rights, Fundamental Duties and Directive Principles of State policy Further it is aimed to impart the knowledge about judicial system in India.

Module I:

1. Nature of Indian Constitution
2. Preamble
3. Union and its Territory (Arts1-4)
4. Citizenship (Arts5-11)
5. Definition of State (Art12)

Module II:

1. Judicial Review (Article13)
2. Right to Equality (Article14)
3. Prohibition on grounds of Religion, Race, Caste, Sex, Place of Birth (Article15)
4. Equality of Opportunity in Public Employment (Article16)
5. Abolition of Untouchability and Titles (Articles17-18)

Module III:

1. Basic freedoms (Article 19)
2. Protection in respect of conviction for offences (Article20)
3. Right to Life and Personal Liberty (Article21)
4. Safeguards against arbitrary arrest and detention (Article22)

Module IV:

1. Right against exploitation (Articles23-24)
2. Freedom of Religion (Articles25-28)
3. Cultural and Educational Rights of Minorities (Articles 29-30)
4. Constitutional Remedies (Articles32-35)

Module V:

1. Directive Principles of State Policy and their relation with Fundamental Rights (Articles36-51)
2. Fundamental Duties (Article 51-A)
3. Right to Property (Article300-A)
4. Facts and Law laid down in Maneka Gandhi V Union of India AIR 1978SC597
5. Facts and Law laid down in Indira Sawhney V Union of India AIR 1993 SC 477

Books Recommended:

1. Austin Granville- the Indian constitution: Cornerstone of a Nation.
2. Seervai H.M. - Constitution of India
3. Jain M.P. – Indian Constitutional Law
4. Shukla V N- Constitution of India (Ed. By M.P.Singh)
5. Basu D.D. – Shorter Constitution of India

JHARKHAND Rai University

Programme: B.Tech

Semester: V

Course: Professional skill

Course Code: HSMC301

L	T	P	C
2	0	0	0

COURSE OBJECTIVE-The aim is to develop students' soft skills, communication, leadership and teamwork skills; and personal development skills using practical approach and exposure of students to the realities of the world.

- To enhance Leadership – assessing the requirements of a task, identifying the strengths/weaknesses within the team, utilizing the diverse skills of the group to achieve the set objectives.
- To improve Communication – demonstrating clear briefing and listening /speaking skills.
- To make them realize that effective communication and interpersonal skills are crucial to increase employment opportunities and to compete successfully in the business environment.
- The course aims to cause a basic awareness about the significance of soft skills in professional and inter-personal communications and facilitate an all-round development of personality. Hard or technical skills help securing a basic position in one's life and career .But only soft skills can ensure a person retain it, climb.

Module I: Personal Development

Managing Self - Self Discovery, Self Awareness, Self Esteem, Self Responsibility, Self

Management Personal Development Skills, Categories of Personal Development, Personal

Development Process

Relationship Management - Managing Others, Interpersonal Skills, Improving Relationship, Transactional Analysis, JOHARI Window, four Life Positions

Module II: Thinking Process

Strategic Thinking – Introduction, Concept, Stages in Strategic Thinking, Process of Strategic Thinking, Importance of Strategic Thinking, Characteristics of Strategic Thinkers, Developing Strategic Thinking
Lateral Thinking – Introduction, Meaning, Need for Lateral Thinking, Techniques of Lateral Thinking, Benefits of Lateral Thinking
Creative Thinking – Out of Box Thinking, Application of Thinking

Facing Changes – Adapting Change, Understanding Change- Examples of Organizational Change Facing Challenges – Introduction, Taking Initiative, Benefits of facing challenges,

facing challenges in life
Balancing Work and Life – Importance, Gender differences regarding work life balance, Tips for balancing work and life

Module III: Individual Behavior

Attitude – Components of Attitude, Factors influencing Attitude, Types of Attitude, Challenges and lessons from Attitude, Impact of Attitude on Behavior
Motivation – Concept, Objective, Factors of Motivation, Self Esteem, Intrinsic & Extrinsic Motivation
Time Management – Value of Time, Diagnosing Time management, Weekly Planner, To Do List, Prioritizing Work

Stress Management – Introduction, Difference between Stress, Anxiety and Tension, Managing Stress

Applied Ethics – Introducing Professional Ethics, Ethical Dilemma

Module IV: Employment Communication

Job Communication – Developing Job Communication Skills, Job Communication Process, Developing Confidence
Job Search Strategy – Understanding the Job Market, the Job Search Process, Job Search Techniques
Job Application, Employment Letters
Resume Building – Difference between Bio data, Curriculum Vitae and Resume

The Job Interview - Types of Job Interview, Preparing for a Job Interview, Understanding Interview Questions, Handling Interview Questions, Interview Strategies
Psychometric Test

Suggested Readings:

1. Covey S (2004) the 7 Habits of Highly Effective People.
2. Goud, N. &Arkoff, A. (2003) Psychology and Personal Growth, Allyn &Bacon.
3. Sen, Leena, Communication Skills, Eastern Economy Edition
4. Dr. K.Alex Managerial Skills,S.Chand

Programme: B.Tech

Semester: V

Course: Power system I Lab

Course Code: 6PCCEE301P

L	T	P	C
0	0	2	1

List of Experiments:

1 Electrical design of transmission line.

2 Mechanical design of transmission line.

3 Drawing of Tower structure.

4 Drawing of insulators

5 Study of Turbines.

JHARKHAND Rai University

Programme: B.Tech

Semester: V

Course: Control system Lab

Course Code: 6PCCEE302P

L	T	P	C
0	0	2	1

List of Experiments:

1. To generate the transfer function of open loop and closed loop transfer function of 1st order system in OCTAVE.
2. To generate the transfer function of open loop and closed loop transfer function of 2nd order system in OCTAVE.
3. To find the output time response of 1st order system with input test signal.
4. To find the output time response of 1st order system with input test signal.
5. To obtain the root locus plot of a given transfer function and plot the graph in OCTAVE.
6. To obtain the root Bode plot of a given transfer function for stability analysis in OCTAVE.
7. Design of PID controller and analyze the design parameters for stability in OCTAVE

JHARKHAND Rai University

Programme: B.Tech

Semester: V

Course: Electrical Machines -II Lab

Course Code: 6PCCEE303P

L	T	P	C
2	0	2	1

List of Experiments:

1. To study the construction of three phase synchronous Generator (Alternator).
2. To study the construction of three phase Induction motor.
3. To study the different starting methods of three phase Induction motor.
4. To study the construction of Single phase Induction motor.
5. To conduct OC (no load) & SC (Block rotor) tests on given single phase Induction motor & determine its equivalent circuit.
6. To study the running conditions & to reverse the direction of rotation of three phase synchronous Generator.
7. To run the capacitor start capacitor run induction motor & also observe its behavior.

JHARKHAND Rai University

Programme: B.Tech

Semester: V

Course: Microprocessors Lab

Course Code: 6PCCEE304P

L	T	P	C
0	0	2	1

List of Experiments:

1. To examine and modify the contents of the registers in 8085 microprocessor kit.
2. To examine and modify the contents of any memory locations.
3. Write 8085 assembly language program for addition of two 8-Bit numbers.
4. To write a assembly language program for subtracting two 8- Bit numbers by using-8085 microprocessor kit.
5. To find the 1's Compliment of a given 8-Bit numbers.
6. To arrange the given numbers in ascending orders.
7. To find the largest number among given numbers.
8. To find the Smallest number among given numbers.