SHRI SHANKARACHARYA TECHNICAL CAMPUS, BHILAI

(An Autonomous Institute affiliated to CSVTU, Bhilai)

SCHEME OF TEACHING AND EXAMINATION (Effective from 2020-2021 Batch)

B.Tech. (Electrical Engineering) Fourth Semester

Sl. No.	Board of Studies (BOS)	Courses(Subject)	Course Code	Period per Week			Scheme of Examination			Total Marks	Credit
							Theory/Lab				
				L	T	P	ESE	CT	TA		
1	Electrical Engineering	Power System-I	EE104401	3	1	-	100	20	30	150	4
2	Electrical Engineering	Electro Magnetic Field	EE104402	3	-	-	100	20	30	150	3
3	Electrical Engineering	Digital Electronics	EE104403	2	1	-	100	20	30	150	3
4	Electrical Engineering	Electrical Measurements & Measuring Instruments	EE104404	3	-	-	100	20	30	150	3
5	Electrical Engineering	Electrical Machines-II	EE104405	3	-	-	100	20	30	150	3
6	Electrical Engineering	Computer Simulation Lab	EE104491	-	-	-	25	-	25	50	1
7	Electrical Engineering	Electrical Measurement and Measuring Instruments Lab	EE104492	-	-	2	25	-	25	50	1
8	Electrical Engineering	Digital Electronics Lab	EE104493	-	-	2	25	-	25	50	1
9	Electrical Engineering	Electrical Machines-II (Mini Project – II)	EE104494	-	-	2	50	-	25	75	1
10	Applied Chemistry	Biology for Engineers	AC100495	-	-	2	-	-	25	25	-
Total				**14**	**2**	**8**	**625**	**100**	**275**	**1000**	**20**

Note:

(a) Abbreviations used:L-Lecture,T-Tutorial,P-Practical,ESE-EndSemesterExam,CT-ClassTest,TA-Teacher'sAssessment

(b) Thedurationofendsemesterexaminationofalltheorypaperswillbeofthreehours.

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SYLLABUS

B.Tech. (Electrical Engineering) Fourth Semester

Subject Code	0EE104401	L=3	T=0	P=0	Credits=4
Subject	POWER SYSTEM-I	CT	TA	Total	ESE Duration
Evaluation Scheme	100	20	30	150	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. Students will understand the concept of national grid, smart grid and components of power system. 2. Students will understand the various line parameters for different configurations of transmission lines. 3. Students will perform the analysis of short, medium and long transmission lines. 4. Students will have to solve the problems related to insulation resistance and capacitance calculation in underground cables. 5. Students will have to analyze and design the future expansion of existing system.	After learning the course the Students should be able to: **CO1:**Describe the concept of different grids and components of power system. **CO2:**Calculate various line parameters for different configurations of transmission lines and cables. **CO3:**Describe the analyze and design the future expansion of existing system by using power flow analysis.

Unit I: Introduction To Power System: **CO1**

Evolution of Power System, Structure of Power System, Introduction of Bulk Power Grid and Micro Grid, Overview of National Grid, Introduction of Smart Grid.

Power System Components:

Single Line Diagram of Power System, Brief Description of Power System Elements: Synchronous Machine, Transformer, Transmission Line, Bus Bar, Circuit Breaker and Isolator Supply System Different Kinds of Supply System and Their Comparison, Choice of Transmission Voltage Transmission Lines: Configurations, Types of Conductors, Resistance of Line, Skin Effect, Kelvin's Law. Proximity Effect **[10 Hrs]**

Unit Ii: Overhead Transmission Line: **CO2**

Calculation of Inductance and Capacitance of Single and Three Phase Lines for Single and Double Circuit Configuration, Concept of Gmr and Gmd, Effect of Earth on Line Capacitance, Skin Effect and Proximity Effect, Types of Load, Voltage and Frequency Dependence of Loads and Per Unit System. **[8 Hrs]**

Unit Iii: Transmission Line Performance Analysis: **CO2**

Classification of Transmission Lines I.E Short, Medium and Long Lines, Nominal T, Nominal Π, Equivalent T and Equivalent Π Circuits, Calculation of Abcd Constants for Short, Medium and Long Lines, Calculation of Efficiency and Regulation of Short, Medium and Long Lines, Ferranti Effect, Surge Impedance Loading. **[10 Hrs]**

Unit Iv: Underground Cables: **CO2**

Classification of Underground Cables, Components of Underground Cables, Insulation Resistance and Capacitance of Underground Cables and their Calculations, Capacitance Grading and Inter Sheath Grading, Capacitance of Three Core Belted Cable, Dielectric Loss In Cable and Concept of Tan Δ. **[10Hrs]**

Unit V: Power Flow Studies **CO3**

Importance of Power Flow Analysis in Planning and Operation of Power Systems - Statement of Power Flow Problem – Formulation of Power Flow Equations-Classification of Buses - Iterative Solution Using Gauss-Seidel Method - Iterative Solution Using Newton-Raphson Method- Decoupled Load Flow Studies- Comparison of Load Flow Methods. **[10Hrs]**

Text Books:

S. No.	Title	Author(s)	Publisher
1.	Power System Engineering	Nagarath and Kothari	TMH publisher
2.	Power System Analysis and Design	B. R. Gupta	S. Chand Publisher.

Reference Books:

S. No.	Title	Author(s)	Publisher
1.	Electric Power Transmission System Engineering and Design	TarunGonen	CRC press, Taylor and Francis series.
2.	Power System Analysis	Jhon J. Grainger and W. D. Stevenson	McGraw Hill Education
3.	Smart Grid Fundamentals and applications	I. S. Jha, SubirSen, Rajesh Kumar and D. P. Kothari	New Age International Publication

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SYLLABUS

B.Tech. (Electrical Engineering) Fourth Semester

Subject Code	EE104402	L=3	T=0	P=0	Credits=3
Subject	Electro Magnetic Fields	CT	TA	Total	ESE Duration
Evaluation Scheme	100	20	30	150	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objective of this course is to introduce the concepts of electric field and magnetic fields and their applications which will be utilized in the development of the theory for power transmission lines and electrical machines	**Student will be able to:-** **CO1:** To differentiate different types of coordinate systems and use them for solving the problems of electromagnetic field theory so as to apply the theory in practical problems. **CO2:**Compute electric field intensity, electric flux & potential for various charge distribution and to describe static electric and magnetic fields, their behavior in different media, associated laws, equations, boundary conditions and electromagnetic potentials. **CO3:**Compute magnetic field intensity and magnetic flux density using associated laws and theorems. **CO4:**To use integral and point form of Maxwell`s equations for solving the problems of electromagnetic field theory and to describe time varying fields, propagation of electromagnetic waves in different media, Pyonting theorem, their sources & effects.

Unit-I :Review of Vector Calculus and Electromagnetic field: **CO1,2**

Vector Algebra, Components of vectors, Scalar and Vector multiplications, Three orthogonal Coordinate systems (cartesian, cylindrical and spherical), Transformation between coordinate systems, Vector calculus (differentiation, partial differentiation, integration), vector operator (del, gradient, divergence and curl, integral theorems of vectors; Coulomb's law, Electric field intensity, Electrical field due to charge distributions (Point, Line, Surface and Volume charge distributions.) **[8 Hrs]**

Unit II: Static Electric Fields: **CO1,2**

Electric flux and Electric flux density, Gauss's law and its application (symmetrical charge distribution only), divergence and divergence theorem, Maxwell's first equation, Electric potential and potential difference, potential field of a point charge, Maxwell's curl equation, potential gradient, Electrostatic Energy and Energy density. **[8 Hrs]**

UnitIII: Electric current, Poisson & Laplace equations: **CO1,2**

Current and current density, continuity of current, metallic conductors, conductor properties and boundary conditions, Electric dipole and dielectric materials, boundary conditions of perfect dielectric materials, Method of images, Poisson's and Laplace's equations, solution of Laplace equations (one dimension only). **[6 Hrs]**

Unit IV: Static Magnetic Fields: **CO3**

Steady state magnetic field, Biot-Savart Law, Ampere's circuital Law, Curl of H,Stoke's theorem, Steady magnetic fields produced by current carrying conductors. Magnetic flux and Magnetic flux density, Scalar and Vector Magnetic potentials, Force on a moving charge, Force on a differential current element, magnetic materials, Magnetization and permeability, Magnetic boundary conditions. **[6 Hrs]**

Unit V:Time Varying Fields and Maxwell's Equations: **CO4**

Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Skin effect, Poynting Theorem and poynting vector. **[8 Hrs]**

Text Books:

S. No.	Title	Author(s)	Publisher
1.	Elements of Electromagnetic	Mathew N.O.	Oxford university press
2.	Engineering Electromagnetic	W.H. Hyat& J.A. Buck	Tata Mcgraw Hill Publisher

Reference Books:

S. No.	Title	Author(s)	Publisher
1.	Electromagnetic field theory fundamentals	Edminister	Tata Mcgraw Hill Publisher
2.	Electromagnetic with application	Krause	Tata Mcgraw Hill Publisher
3.	Elements of Engineering Electromagnetic	N.N. Rao	Pearson Education

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SYLLABUS

B.Tech. (Electrical Engineering) Fourth Semester

Subject Code	EE104403	L = 2	T = 1	P = 0	Credits = 3
Subject	Digital Electronics	CT	TA	Total	ESE Duration
Evaluation Scheme	100	20	30	150	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
1. To prepare the students to understand the basics of logic gates and implement in designing logic circuits, Combinational logic circuits, Sequential logic circuits with the application of various minimizing techniques. 2. To make students to understand and design concepts and operations of memory organization & implementation of various memory subsystems.	**Students will be able to:-** **CO1:**Design, build, test, troubleshoot, and evaluate digital circuits with conclusions needed in any project design. **CO2:**Design basic digital circuits and also advanced circuits like Combinational logic circuits, sequential logic circuits which is core requirement in any circuitry. **CO3:**Construct a small memory subsystem & will able to use PLDs for logic implementation.

UNIT I: Binary Number Systems & Codes: **CO1,2**

Number System: Decimal, binary, Octal, Hexadecimal Number Systems, Conversion Of Number Systems, r's& (r-1)'s Complement.

Binary Codes:

Weighted & Non Weighted Codes, Sequential Code, Self- Complementing Code, Cyclic Code, Excess-3 Code, Gray Code ASCII & EBCDIC Codes, Error Detecting & Correcting Code, Hamming Cod,.

Boolean Algebra:

Reduction Of Boolean Expression Using Identities, Laws & Theorems, Basic & Universal Logic Gates, NAND-NOR Implementation, Converting AND/ OR/ Invert Logic to NAND/ NOR Logic. **[8Hrs]**

UNIT II: Minimization Techniques: **CO1,2**

Minimization of Boolean Function in SOP & POS, Canonical & Standard Form, Min-Term, Max-Term, Mapping & Minimization of SOP & POS Expression Using Two, Three & Four Variables K-Map, Concept of Don't Care Terms, Quine-Mccluskey or Tabulation Method of Minimization. **[6Hrs]**

UNIT III: Combination Logic Circuits: **CO1,2**

Half Adder, Full Adder, BCD Adder, Look Ahead Carry Generator, Serial Adder, Half Subtractor, Full Subtractor, Binary Parallel Adder, Binary Parallel Subtractor, Parity Bit Generator/ Checker, Magnitude Comparators, Code Converters, Decoders, BCD To Seven Segment Decoder, Encoders, Priority Encoders, Multiplexer,Boolean Function Implementation with MUX, Demultiplexer. **[6Hrs]**

UNIT IV: Sequential Logic Circuits: **CO1,2**

Flip Flops: Edge Triggered S-R, D, J-K And T Flip-Flops, Race Around Condition, Master-Slave Flip-Flops, Mutual Conversions of Flip-Flops.

Counters:

Asynchronous Ripple or Serial Counter, Up/Down Counter, Decade Counter, Synchronous Counter, Up/Down Synchronous Counters, Module-N Synchronous Counters, RING Counters, Johnson Counter, **Shift Registers:**

SISO, SIPO, PISO, PIPO, Bi-Directional Shift Registers, Universal Shift Registers. **[8Hrs]**

UNIT V: Memory Organization and PLD Devices: **CO1,2,3**

Memory Organization, Memory Size, Classification And Characteristics of Memories, Random and Sequential Access Memory, Read Only Memory (ROM), Read And Write Memory (RAM).

Logic Array:

PROM, ROM, PAL, PLA. **[8Hrs]**

Text Books:

S. No.	Title	Author(s)	Publisher
1.	Digital Logic and Computer Design	M. Morris Mano	Pearson Education India
2.	Modern Digital Electronics	R. P. Jain	McGraw Hill Education

Reference Books:

S. No.	Title	Author(s)	Publisher
1.	Fundamentals of Digital Circuits	A.Anand Kumar	Prentice Hall India
2.	Digital Integrated Electronics	H. Taub and D. Schilling	TMH Publications

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SYLLABUS

B.Tech. (Electrical Engineering) Fourth Semester

Subject Code	0EE104404	L = 3	T = 0	P = 0	Credits = 3
Subject	ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS	CT	TA	Total	ESE Duration
Evaluation Scheme	100	20	30	150	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To measure low, medium and high resistances. 2. To make students to understand the concept of various bridges and their calibration techniques 3. To make students understand the working and uses of various measuring instruments, metering devices and detectors. .	**Students will be able to:-** **CO1:**Understand the types of resistances and its measuring techniques. **CO2:**Calculate the inductance, capacitance and frequency under measurement by using AC bridges. **CO3:**Understand various electronic or digital meters and its significance. **CO4:**Understand the working and uses of various measuring devices and instruments employed for different electrical quantity measurements.

UNIT- I Measurement of Resistance: **CO1,2**

Classification of resistances (low, medium and high), measurement of resistance by volt drop method, loss of charge method, Wheatstone's bridge, Kelvin's double bridge, Megger and ohmmeter, AC Potentiometers and their use for calibration of meters (ammeter, voltmeter and wattmeter). **[8Hrs]**

UNIT-II AC Bridges: **CO1,2,4**

Measurement of inductance (self and mutual) and capacitance by AC bridges: Hay's, Maxwell's,
Anderson, Desauty's bridge, Schering bridge, Oven's bridge and Heaviside bridge and its modification, Wien's bridge for measurement of frequency, Wagner earthing device. **[8Hrs]**

UNIT- III Detectors and Digital Meters: **CO2,4**

Construction, theory and operation of D'Arsonval and vibration galvanometer, CRO – Basic Principle, CRT feature, Block diagram, Triggered sources, Measurement of frequency and phase by Lissajous Figures, DSO, Comparison with analog CRO, PC Based DSO.

Digital Multi-meter: Block diagram, principle of operation, Accuracy of measurement, Electronic Voltmeter: Transistor Voltmeter, Block diagram, principle of operation, various types of electronic voltmeter, Digital Frequency meter: Block diagram, principle of operation **[8Hrs]**

UNIT-IV Measuring Instruments: **CO3,4**

Classification, operation and working principle of PMMC, MI and dynamometer type instruments, controlling, damping and balancing devices, single-phase and three-phase electrodynamometer power factor meter, frequency meters: electrical resonance type, electrodynamometer, ratio-meter type. Phase sequence meter, maximum demand indicator. **[6Hrs]**

UNIT-V Power and Energy Measurement: **CO1,3,4**

Construction and principle of dynamometer and induction type wattmeter, measurement of power in a three-phase circuit by using single-phase wattmeter, wattmeter errors, low power factor wattmeter, testing of wattmeter, single and poly-phase energy meters, testing of energy meters. **[6Hrs]**

Text Books:

S. No.	Title	Author(s)	Publisher
1.	A Course In Electrical And Electronics Measurement And Instrumentation	A K Sawhney	TMH publisher
2.	Electrical Measurement and Measuring Instruments	Golding	CBS Publication
3.	Electronic Instrumentation	H. S. Kalsi	TMH Publications

Reference Books:

S. No.	Title	Author(s)	Publisher
1.	A Course In Electrical And Electronics Measurement And Instrumentation	J. B. Gupta	KatariaPbs
2.	Electric Measurements	Harris	Wiley Publication
3.	Electrical Measurements and Instrumentation	Cooper	TMH Publications
4.	Digital circuit and design	Salivahan and Aricozhagan	Digital circuit and design

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B.Tech. (Electrical Engineering) Fourth Semester

Subject Code	0EE104405	L = 3	T = 0	P = 0	Credits = 3
Subject	ELECTRICAL MACHINES-II	CT	TA	Total	ESE Duration
Evaluation Scheme	100	20	30	150	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The Objective of this course are: 1. To Apply the concepts of AC machine windings 2. To Analyze the concepts of rotating magnetic fields and operation, power calculation and losses of three phase Induction Motors. 3. To Understand the starting, speed control of three phase induction motors. 4. To Understand the working of Single-phase induction motors. and special motors. 5. To Analyze the performance, characteristics and operation of synchronous machines.	After learning the course the Students should be able to: **CO1:**To introduce synchronous and induction machines.. **CO2:**To Analyze the concepts of rotating magnetic fields and operation of three phase Induction Motors . **CO3:**To Understand the starting, speed control of three phase induction motors. **CO4:**To Understand the working of Single-phase induction motors. and special motors. **CO5:**ToAnalyze the performance, characteristics and operation of synchronous machines.

UNIT I: Basics of AC Machine Windings: **CO1**

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, Air Gap MMF Distribution with Fixed Current Through Winding, Concentrated and Distributed, Sinusoidally Distributed Winding, Winding Distribution Factor, Rotating Magnetic Field. **[8 Hrs]**

UNIT II : Three Phase Induction Machines : **CO1, 2,3**

Construction, operation, Types, 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.Cogging and Crawling, Double Cage Induction Motors, No-Load and Block Rotor Test, Circle Diagram. Phasor Diagram. **[8 Hrs]**

UNIT III Single-phase induction motors: **CO1,4**

Constructional features, Double revolving field theory, Equivalent circuit, Determination of parameters-No load test Blocked rotor test, Cross field theory, starting methods, Characteristics and applications. **[8 Hrs]**

UNIT IV:A.C Commutator motor and Special motor: **CO1,4**

A.C Commutator motor- Construction, principle of operation and application of Single phase series motor, universal motor, Repulsion motor. Special motor- Construction, principle of operation and application of Variable Reluctance motor, Stepper motor, Linear Induction motor, Permanent Magnet Brushless DC motor, Permanent Magnet Synchronous motor. **[6 Hrs]**

UNIT V: Synchronous Machines: **CO1,5**

Synchronous Generators:

Constructional Features, Types, Generated EMF, Equivalent Circuit, Phasor Diagram, Operating Characteristics, Armature Reaction, Power flow Analysis, Synchronous Impedance, Voltage Regulation (EMF,MMF and Zero Power Factor Method), Parallel Operation of Alternators - Synchronization and LoadDivision.

Synchronous Motor:

Operation, Construction**,** Analysis of Phasor Diagram, Two Reaction Theory, V-Curves, Power Angle Characteristics. **[6 Hrs]**

Text Books:

S.No.	Title	Author(s)	Publisher
1.	Electric Machinery	A. E. Fitzgerald and C. Kingsley	McGraw Hill Education
2.	Performance and design of AC machines	M. G. Say	CBS Publishers

Reference Books:

S.No.	Title	Author(s)	Publisher
1.	Electrical Machinery	P. S. Bimbhra	Khanna Publishers
2.	Electric Machines	I. J. Nagrath and D. P. Kothari	McGraw Hill Education
3.	Alternating current machines	A. S. Langsdorf	McGraw Hill Education

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SYLLABUS

B.Tech. (Electrical Engineering) Fourth Semester

Subject Code	EE104491	L = 0	T = 0	P = 2	Credits = 1
Subject	COMPUTER SIMULATION LAB	CT	TA	Total	ESE Duration
Evaluation Scheme	25	NA	25	50	3 hrs.

COURSE OBJECTIVES	COURSE OUTCOMES
1. Student will be able to understand the basic concept and commands of MATLAB. 2. Student will be able to create matrix and determine the maximum and minimum valuesin it. 3. Student will be able to plot for the functions in MATLAB. 4. Student will be able to apply MATLAB in various domain. 5. Students will be able to calculate different parameters with the help of MATLAB.	**After learning the course the Students should be able to:-** **CO1:**Explain the basic concept and commands of MATLAB. **CO2:**Create matrix and determine the maximum and minimum valuesin it. **CO3:** Plot for the functions in MATLAB **CO4:** Explain the application of MATLAB in various domain. **CO5:** Calculate different parameters with the help of MATLAB.

List of Experiments: (At least ten experiments are to be performed by each student)

MATLAB Basics:

1. Introduction to MATLAB and its basic commands.
2. Create a matrix and determine the size, display every element of z, create sub arrays.
3. Input two 4 x 4 arrays A and Band do the following:
   - A. Find the maximum and minimum values in each column of A and B.
   - B. Find the maximum and minimum values in each row of A and B.
   - C. Find the maximum and minimum values of A and B.
   - D. Find the result of the expressions A⊔B, A*B, A.*B, A./B, A.\B.
   - E. Find transpose and inverse of A and B. F. Find rank of A and B
   - F. Reshape the matrices to another array of different size.
4. Make a three dimensional plot for the function.
5. MATLAB Programming to convert polar to rectangular coordinates.

MATLAB Applications:

6. MATLAB program to simulate Ferranti effect.
7. MATLAB program to calculate sending end voltage, current and power factor in short transmission line.
8. MATLAB program to calculate sending end voltage, current and power factor in medium transmission line.
9. MATLAB program to calculate sending end voltage, current and power factor in long transmission line
10. Let a voltage source V = 120 V with an internal resistance R of 5 Ω be connected with a load resistance RL. Using MATLAB create an array of RL from 1 Ω to 100 Ω with a step size of 1. Plot the power supplied to the load as function of RL. From the plot find the value of RL that will result in the maximum possible power being supplied by the source to the load. How much power will be supplied in this case?
11. In a series RLC circuit the initial inductor current is zero and having the initial capacitor voltage . A step voltage is applied at time t = 0, Determine i(t) and v(t) over the range 0< t<15 sec. Also obtain one plot of current i(t) and capacitor voltage v(t) versus time.
12. A simple low pass filter circuit consists of a resistor R and capacitor C in series, and the ratio of the output voltage Vo to the input voltage Vi is given by where, Vi is the sinusoidal input voltage of frequency f. Plot the amplitude and frequency response of this filter.
13. For the medium line model, write a general MATLAB program to find the power at the sending end and the voltage regulation.
14. Write MATLAB Program to simulate the series RL circuit and find the response of current to (a) a DC signal (b) to an AC signal. Also show the plots for voltage and current in a single plot for case (b) and comment on the phase difference between the two for various values of R and L.
15. Use Simulink to create a single phase rectifier circuit to convert an AC signal to DC.

Equipment/Machines/Instruments/Tools/Software Required: MATLAB 2020 Version.
Recommended Books:

S. No.	Title	Author(s)	Publisher
1.	Modelling& Simulation Using MATLAB	Dr. Shailendra Jain	Wiley Publications
2.	MATLAB for Electrical & Computer Engineering Students & Professionals	Roland Priemer	Wiley Publications

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SYLLABUS

B.Tech. (Electrical Engineering) Fourth Semester

Subject Code	0EE104492	L=0	T=0	P=2	Credits=1
Subject	Electrical Measurement &Measuring Instruments Lab	CT	TA	Total	ESE Duration
Evaluation Scheme	25	-	25	50	-

COURSE OBJECTIVES	COURSE OUTCOMES
1. To impart the concepts of electrical measuring instruments practically and train students to learn experimental techniques applied to electrical circuits using instruments and get the read out.	**Students will be able to:-** **CO1:**Calibrate, connect, test, troubleshoot, and evaluate reading with conclusions in any system/circuit electrical parameters measurement. **CO2:**Understand the technique and usage and process involved while using various instruments.

List of Experiments: (At least ten experiments are to be performed by each student)

1. To Study construction of different types of meters & study how to connect them in a circuit..
2. To calibrate a voltmeter & an ammeter using a potentiometer.
3. Determination of unknown inductance and Q factor using Hay's bridge method
4. High Resistance Measurement by Leakage Method
5. Determination of unknown resistance using Kelvin's Bridge method
6. To measure inductance by Maxwell's bridge.
7. To measure power &p.f. by 3-ammeter & 3 Voltmeter methods.
8. To Measure resistance using Wheatstone bridge /Post office box
9. To measure capacitance by Desauty's bridge.
10. To measure frequency by Wien's bridge
11. Calibration of Dynamometer power factor meter.
12. To measure self-inductance using Anderson bridge
13. To measure capacitance using Schering Bridge
14. Measurement of 3-phase reactive power with single-phase wattmeter
15. Measurement of parameters of choke coil using 3 voltmeter and 3 ammeter method

List of Equipment Required in the Lab.

S. No.	Equipment/Machines/Instruments Required
1.	Bridges
2.	Head Phones
3.	CRO.
4.	Transformer
5.	Variac
6.	Voltmeter
7.	Ammeter
8.	Multimeters
9.	Resistors
10.	DC Supply
11.	Meggar

Recommended Books:

S. No.	Title	Author(s)	Publisher
1.	Basic Theory and Laboratory Experiments in Measurement and Instrumentation by	Cataldo, A., Giaquinto, N., De Benedetto, E., Masciullo, A., Cannazza, G., Lorenzo, I., Nicolazzo, J., Meo, M.T., Monte, A.D., Parisi, G., Gaetani, F,	Springer International Publishing

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SYLLABUS

B.Tech. (Electrical Engineering) Fourth Semester

Subject Code	0EE104493	L=0	T=0	P=2	Credits=1
Subject	DIGITAL ELECTRONICS LAB	CT	TA	Total	ESE Duration
Evaluation Scheme	25	-	25	50	-

COURSE OBJECTIVES	COURSE OUTCOMES
1.To impart the concepts of digital electronics practically and train students. 2. To learn experimental techniques applied to digital integrated circuits. 3. To realize the combinational & sequential logic circuits.	**Students will be able to:-** **CO1:**Design and evaluate digital circuits. **CO2:**Utilize computer software such as electronic work bench (Multi Sim). **CO3:**Design Combinational & Sequential logic circuits.

List of Experiments: (At least ten experiments are to be performed by each student)

1. To verify the properties of NOR & NAND gates as universal building blocks.
2. Realization of boolean expression using NAND or NOR gates.
3. To construct X-OR gate using only NAND & NOR gates.
4. To construct a half adder circuit with logic gates and verify its truth table.
5. To construct a full adder circuit with logic gates and verify its truth table(Using2 X-OR and 3 NAND gates).
6. To construct a half subtractor circuit by using basic gates and verify its truth table.
7. To construct a full subtractorcircuit by using basic gates & verify its truth table.
8. To construct a circuit of 4 bit parity checker and verify its truth table.
9. To construct a programmable inverter using X-OR gates & verify its truth table.
10. To design a comparator circuit & verify its truth table.
11. To construct a RS flip-flop using basic and universal gates(NOT,NOR & NAND)
12. To construct a JK master slave flip-flop & verify its truth table.
13. To verify the operation of clocked SR flip-flop and JK flip-flop.
14. To construct a T & D flip-flop using JK flip-flop and verify its operation & truth table.
15. To verify the operation of asynchronous decade counter.
16. To verify operation of various decoding and driving devices.
17. To perform the operation of BCD counter using 7490.

List of Equipment Required in the Lab.

S.No.	Equipment/Machines/Instruments Required
1.	Circuit components.
2.	Power supply.
3.	CRO.
4.	Function generator.

Recommended Books:

S. No.	Title	Author(s)	Publisher
1.	Digital Logic and Computer Design	M. Morris Mano	Pearson Education India
2.	Modern Digital Electronics	R. P. Jain	McGraw Hill Education

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SYLLABUS

B.Tech. (Electrical Engineering) Fourth Semester

Subject Code	EE104494	L = 0	T = 0	P = 2	Credits = 1
Subject	ELECTRICAL MACHINES-II LAB(MINI PROJECT - II)	CT	TA	Total	ESE Duration
Evaluation Scheme	50	NA	25	75	3 hrs.

COURSE OBJECTIVES	COURSE OUTCOMES
The Course Objectives of this course are: 1.To Get an exposure to common electrical equipment and their ratings. 2.To Perform various tests on three phase induction motor and special motors. 3.To Understand the usage of common electrical measuring instruments. 4.To Perform speed control on three phase and single phase induction motor. 5.To Determine the voltage regulation of 3 phase alternator by different methods.	**Students will be able to:-** **CO1:**Get an exposure to common electrical equipment and their ratings. **CO2:**Perform various tests on three phase induction motor. **CO3:**Understand the usage of common electrical measuring instruments. **CO4:**Perform speed control on induction motor. **CO5:**Determine the voltage regulation of 3 phase alternator by different methods.

List of Experiments: (At least ten experiments are to be performed by each student)

1. To determine the equivalent circuit parameters of 3-phase induction motor by No Load test and Block Rotor test.
2. To determine Measurement of Speed of Induction Motor by Measuring Rotor Frequency.
3. To study the speed control of a three phase slip ring Induction Motor by adding external resistance to the rotor circuit.
4. To Study DOL starter and provide connection to 3 phase Induction motor.
5. To study Speed reversal of single phase induction motor.
6. To study Characteristics of stepper motor.
7. To determine Measurement of circuit Constant of single phase induction motor.
8. To study synchronization of two alternators with each other and effect of change in excitation and speed (frequency) on load sharing.
9. To determine the voltage regulation of 3 phase alternator by EMF method.
10. To plot the V and inverted V curve of synchronous Motor at No Load, and Full Load.
11. To determine Xd & Xq of synchronous machine.
12. To determine zero sequence reactance by synchronous machine.
13. To Study Star-Delta starter and provide connection to 3-phase Induction motor.
14. To study speed control of Induction motor by Cascade connection.
15. To determine the voltage regulation of 3 phase alternator by direct loading.
16. To determine the voltage regulation of 3 phase alternator by ZPF method.

Equipment/Machines/Instruments/Tools/Software Required:

S. No.	Equipment/Machines/Instruments Required
1.	Single Phase Tapped Transformers, Auto Transformer
2.	Three Phase Transformer, Three Phase Auto Transformer
3.	DC Shunt Motor, DC Series Motor.
4.	Two point, 3 point, 4 point Starters.
5.	DC Shunt Motor-Generator Set.
6.	Ammeters (AC & DC), Voltmeter (AC & DC), Wattmeter, Tachometer.
7.	Rheostats, Variac 1phase. and 3phase.

Recommended Books:

S. No.	Title	Author(s)	Publisher
1.	Electric Machinery	A. E. Fitzgerald and C. Kingsley	Performance and design of AC machines
2.	Electric Machines	I. J. Nagrath and D. P. Kothari	
3.	M. G. Say	McGraw Hill Education, 2013	CBS Publishers, 2002

			1.00	Applicable for AY2021-22Onwards
Chairman(AC)	Chairman (BoS)	Date of Release	Version	

SHRI SHANKARACHARYA TECHNICAL CAMPUS, BHILAI

(An Autonomous Institute affiliated to CSVTU, Bhilai)

SYLLABUS

B.Tech. (Electrical Engineering) Fourth Semester

Subject Code	EE100395	L=2	T=1	P=0	Credits=1
Subject	Biology for Engineers	CT	TA	Total	ESE Duration
Evaluation Scheme	Workshop ,Quiz, Seminar And By Organize Guest Lecture	0	25	25	1 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objective of this course is to impart an understanding of fundamentals ofbiological systems and its applicationstowards industries to solve the problemsin the real life. 1.To convey that Biology is as important scientific discipline as Mathematics, Physics, Chemistry, and Engineering and technology. 2.To convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Discuss the concept human genetics. 3.To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine. The molecular basis of coding and decoding genetic information is universal. 4.How to analyses biological processes at the reductionist level. Concept of Energy change. 5.The fundamental concept and principles of Microbiology.	**On successful completion of the course, the student will be ableto:** **CO1:**Describe how biological observations of 18th Century that lead to major discoveries. **CO2:** Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological. Highlight the concepts of genetic material and its segregation and independent assortment. **CO3:** Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine. Classify enzymes and distinguish between different mechanisms of enzyme action. Concept of genetic code. Universality and degeneracy of genetic code. **CO4:** Identify DNA as a genetic material in the molecular basis of information transfer. The fundamental principles of energy transactions in physical and biological world. Thermodynamics properties of different biological systems. **CO5:** Apply thermodynamic principles to biological systems. Identify and classify microorganisms. A Brief Account of Evolution.

Unit 1. INTRODUCTION **CO1**

Bring out The Fundamental Differences Between Science And Engineering by Drawing a Comparison Between Eye and Camera, Bird Flying And Aircraft. Mention The Most Exciting Aspect of Biology as an Independent Scientific Discipline. Why We Need To Study Biology? Discuss How Biological Observations of 18th Century That Lead to Major Discoveries. Examples From Brownian Motion and The Origin of Thermodynamics by Referring to the Original Observation of Robert Brown And Julius Mayor. These Examples Will Highlight The Fundamental Importance of Observations in Any Scientific Inquiry. **[2 Hrs]**

Unit 2. CLASSIFICATION & GENETICS **CO2**

Hierarchy of Life Forms at Phenomenological Level. A Common Thread Weaves This Hierarchy.Classification. Discuss Based on (A) Cellularity- Unicellular Or Multicellular (B) Ultrastructure- Prokaryotes Or Eucaryotes. (C) Energy And Carbon Utilization -Autotrophs,Heterotrophs, Lithotropes(D) Ammonia Excretion Aminotelic, Uricotelic, Ureotelic (E) HabitataacquaticOr Terrestrial (E) Molecular Taxonomy- Three Major Kingdoms of Life. A Given Organism Can Come Under Different Category Based on Classification. Model Organisms For The Study of Biology Come From Different Groups. E.Coli, S.Cerevisiae, D. Melanogaster, C. Elegance, A. Thaliana, M.Musculus.Mendel's Laws, Concept of Segregation And Independent Assortment. Concept of Allele. Gene Mapping, Gene Interaction, Epistasis. Meiosis and Mitosis Be Taught as a Part of Genetics. Emphasis to Be Give Not to the Mechanics of Cell Division Nor the Phases But How Genetic Material Passes From Parent to Offspring. Concepts of Recessiveness and Dominance. Concept of Mapping of Phenotype to Genes. Discuss About the Single Gene Disorders in Humans. Discuss the Concept of Complementation Using Human Genetics **[3 Hrs]**

Unit 3 BIOMOLECULES & INFORMATION TRANSFER **CO3**

Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination. **[4 Hrs]**

Unit 4. MACROMOLECULAR ANALYSIS & ITS METABOLISM **CO4**

Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO_2 + H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and Energy consuming reactions. Concept of Energy change. **[3 Hrs]**

Unit 5. MICROBIOLOGY EVOLUTION **CO5**

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

Origin of Universe, Origin of Life, Evolution of Life Forms, Evidences of Evolution, Adaptive Radiation, Theories of Evolution Biological Evolution, Hardy–Weinberg Principle. **[3Hrs]**

Text Books:

S.No.	Title	Author(s)	Publisher
1.	Biology: A global approach	Campbell, N. A, Reece, J. B., Urry, Lisa, Cain, M, L., Wasserman, S. A., Miniorsky, P. V., Jackson, R. B.	Pearson Education Ltd
2.	Outlines of Biochemistry	Conn, E.E, Stumpf, P.K., Bruening G., Doi R.H.	John Wiley and Sons
3.	Principles of Biochemistry	Nelson D. L. and Cox M.M.W.H.	Freeman and Company
4.	Molecular Genetics	Stent, G. S.; and Calender, R.W.H.	Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5.	Microbiology	Prescott, L.M J.P. Harley and C.A. Klein	W.M.C. Brown Publishers

Reference Books:

S.No.	Title	Author(s)	Publisher
1.	Biology For Engineers	DrTanu Allen, DrSohini Singh	Vayu Education Of India ,New Delhi
2.	Biology For Engineers	Arthur T.Johnsion	Taylor &Francis Group
3.	Molecular. Cellular and tissue Engineering	Joseph D .Bronzino,Donal R .Peterson	CRC Press
4.	Biology For Engineers	Rajiv Singal,GauravAgrawal,RituBir	CBS Publisher &distributors
5.	Biology For Engineers	G,K,Suraish Kumar	OUP India