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 & Electronics 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.	EEE	Network Analysis & Synthesis	EEE103401	3	1	-	100	20	30	150	4
2.	EEE	Electro Magnetic Field	EEE103402	3	1	-	100	20	30	150	3
3.	EEE	Digital Electronics	EEE103403	3	-	-	100	20	30	150	3
4.	EEE	Electrical Machine-II	EEE103404	2	-	-	100	20	30	150	3
5.	EEE	IOT & Instrumentation	EEE103405	2	-	-	100	20	30	150	3
6.	EEE	Digital Electronics Lab	EEE103491	-	-	2	25	-	25	50	1
7.	EEE	Electrical Machine-II Lab	EEE103492	-	-	2	25	-	25	50	1
8.	EEE	IOT & Instrumentation Lab	EEE103493	-	-	2	25	-	25	50	1
9.	EEE	Mini Project-II/ Industrial Automation Lab	EEE103494	-	-	2	50	-	25	75	1
10.	AC	Biology for Engineers	AC100495	-	-	-	-	-	25	25	-
Total				**14**	**2**	**8**	**625**	**100**	**275**	**1000**	**20**

(a)Abbreviations used: L-Lecture, T-Tutorial, P-Practical, ESE-End Semester Exam, CT-Class Test, TA-Teacher's Assessment
(b)The duration of end semester examination of all theory papers will be of three hours.

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SYLLABUS

B.Tech. (Electrical & Electronics Engineering) Fourth Semester

Subject Code: EEE103401	Network Analysis and Synthesis	L= 3	T = 1	P = 0	Credits= 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
1.To make the students capable of analyzing any given electrical network. 2.To make the students learn how to synthesize an electrical network from a given impedance/admittance function.	On successful completion of the course, the student will be able to: **CO1:** Apply the knowledge of differential equations, Laplace transforms and simplify the networks. **CO2:** Analyze the circuit using Network simplification theorems and analyze the waveforms using Fourier series **CO3:** Infer and evaluate transient response, steady state response, network functions. **CO4:** Evaluate two-port network parameters and symmetrical networks **CO5:** Synthesize one port network using Foster and Cauer Forms.

Unit-I Time Domain and Frequency Domain Analysis: **CO1**

Initial conditions, Procedure for evaluating initial conditions, First and second order networks. State equations, Transient response, Laplace transform of standard signals, Shifting theorem, initial and final value theorem, Solution of circuit equations by Laplace transform. [10 Hrs]

Unit-IINetwork Theorems and Fourier Analysis: **CO2**

Transform impedance and transform circuits, Thevenin's and Norton's theorem,Fourier series, Fourier Coefficients, Exponential Fourier series, Fourier transforms. [10 Hrs]

Unit-III Network Functions: **CO3**

Calculation of network functions, Poles and Zeros of network functions and their restriction, time domain behaviour from pole - zero plots, Determination of the natural frequencies and mode vectors from network functions. [9 Hrs]

Unit-IV Two Port Networks **CO4**

Two-port network parameters ((z, y, h, g, Transmission parameters), Interconnection of two port networks, Condition of Reciprocity and Symmetry, Barlett's bisection theorem. [10 Hrs]

Unit-V Network Synthesis **CO5**

Two-terminal network synthesis, Properties of Hurwitz polynomial and Positive real function, Synthesis of LC, RC and RL Networks, Foster Forms and Cauer Forms. [9 Hrs]

Text Books:

S. No.	Title	Authors	Publisher
1	Network Analysis	Valkenberg V.	Prentice Hall International Edition
2	Network Analysis and Synthesis	Kuo F. F	Wiley India
3	Engineering Circuit Analysis	Hayt W. H., Kemmerly J. E. and Durbin S. M.	Tata McGraw-Hill Publishing Company Ltd

Reference Books:

S. No.	Title	Authors	Publisher
1	Engineering Network Analysis and synthesis and filter design	Bhise G.G, Chadha P.R. and Kulshreshtha D. C.	Umesh Publications
2	Network Analysis and Synthesis	Wadhwa C. L.	New Age Publications
3	Network Analysis and Synthesis	Franklin F. Kuo	Wiley India

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SYLLABUS

B.Tech. (Electrical & Electronics Engineering) Fourth Semester

Subject Code: EEE103402	Electro Magnetic Field	L= 2	T = 1	P = 0	Credits= 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	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	**On successful completion of the course, the student will be able to:** **CO1:**Compute electric field intensity for various charge distribution **CO2:**Compute Electric flux & potential for various charge distribution **CO3:**Compute solution of Laplace and Poisson's equations **CO4:**Compute magnetic field intensity and magnetic flux density using Ampere's circuital Law and Stoke's theorem. **CO5:**Compute force and torque for various current carrying elements. CO6.Enlist Maxwell's equations for time varying fields and solve them for specific regular geometries

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

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: **CO2**

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. [7 Hrs]

Unit-III Electric current, Poisson & Laplace equations: **CO3**

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), Uniqueness Theorem . [7 Hrs]

Unit-IV Static Magnetic Fields: **CO4**

Steady state magnetic field, Biot-Savart Law, Ampere's circuital Law, Curl of magnetic field intensity, 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. [7Hrs]

Unit-V Time Varying Fields and Maxwell's Equations **CO5**

Faraday's law for Electromagnetic induction, statically and dynamically induced EMFs, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Poynting Theorem and poynting vector. [7 Hrs]

Text Books:

S. No.	Title	Authors	Publisher
1	Elements of Electromagnetic	Mathew N.O.	Oxford university press
2	Engineering Electromagnetic	W.H. Hyat& J.A. Buck	TMH
3	Theory and problems of Electromagnetic	Edminister	TMH

Reference Books:

S. No.	Title	Authors	Publisher
1	Electromagnetic with application	Krause	TMH
2	Elements of Engineering Electromagnetic	N.N. Rao	Pearson Education
3	Electromagnetic field theory fundamentals	Guru &Hizroglu	Cambridge University Press

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SYLLABUS

B.Tech. (Electrical & Electronics Engineering) Fourth Semester

Subject Code: EEE103403	Digital Electronics	L= 3	T = 0	P = 0	Credits= 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
1. To know the different codes used in digital electronics and their application. 2. To minimization of Boolean algebra using k-map & tabulation methods. 3.To realize the combinational & sequential logic circuits. 4. To introduce with digital logic families.	CO1. Be able to design, build, test, troubleshoot, and evaluate digital circuits. CO2. Be able to utilize computer software such as Electronic Work Bench (Multisim). CO3. Be able to evaluate and revise designs as actual performance is reviewed. CO4. Be able to prepare a written report that effectively communicates the objective, the design procedure, the experimental results, and the conclusion for any project design.

Unit-I **CO1**

Binary Number Systems & Codes: Number System: Decimal, binary, octal, Hexadecimal number systems, conversion of number systems, r's & (r-1)'s complement. Boolean algebra: Reduction of Boolean expression using Identities, Laws & Theorems, Basic & universal logic gates, NANDNOR implementation, Converting AND/ OR/ Invert logic to NAND/ NOR logic. Binary Codes: Weighted & Non weighted codes, Sequential code, Self- complementing code, Cyclic code, Excess-3 code, Gray code, error detecting & correcting code, Hamming code, ASCII & EBCDIC Codes, Realization of switching functions using Gates. [7 Hrs]

Unit-II **CO2**

Minimization Techniques: 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. [6 Hrs]

Unit-III **CO3**

Combination logic circuits: Half adder, Full adder, Half Subtractor, Full subtractor, Binary parallel adder, Binary parallel subtractor, BCD adder, Look ahead carry generator, Serial adder, Code converters, Parity bit generator/ checker, magnitude comparators, Decoders: 3 line to 8 line decoder, BCD to Decimal decoder, BCD to Seven segment decoder. Encoder: Octal to binary encoder, Decimal to BCD encoder, Multiplexer: 2-input Mux, 4-input Mux & 16-input Mux, Demultiplexer: 1 line to 4 line& 1 line to 8 line De-mux, Logic Array: PAL, PLA, PROM, ROM. [8 Hrs]

Unit-IV **CO4**

Sequential logic circuits: Latches: Active low & high S-R Latch, Gated S-R latch. Flip flops: Edge triggered S-R, D, J-K and T flip-flops, Master-Slave flip-flops & its timing diagram, Truth table & Excitation Table. Asynchronous inputs of flip-flop, Conversion of one flip-flop to other flip-flop. Counters: Asynchronous Ripple or Serial Counter, up/down counter, Decade counter, Synchronous counter, State diagram, 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 **CO4**

Logic families: Introduction of Digital terminologies, Transistor Inverter, RTL and DTL, TTL: Totem pole arrangement, ECL & its specifications. MOS Logic: NMOS NAND & NOR gate, CMOS Inverter, NAND & NOR Gate, comparison among various logic families, manufacturer's Specification
Memories: RAM: Static and dynamic RAM, ROM, PROM, EPROM, EEPROM. [7 Hrs]

Text Books:

S. No.	Title	Authors	Publisher
1	Digital Logic and Concept design	M. Morris Mano	Pearson Publications
2	Fundamentals of Digital Circuits	A. Anand Kumar	PHI Learning Private Limited.

Reference Books:

S. No.	Title	Authors	Publisher
1	Mordern Digital Electronics	R. P. Jain	McGraw Hill
2	Digital Principles And Application	Malvino& Leach	McGraw Hil
3	An Engineering Approach to Digital Design	W. Fletcher	PHI Edition
4	An Introduction To Digital Computer Design	V, Rajaraman and Radhakrishnan	PHI

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SYLLABUS

B.Tech. (Electrical & Electronics Engineering) Fourth Semester

Subject Code: EEE103405	IOT& Instrumentation	L= 3	T = 0	P = 0	Credits= 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
1. To provide students with a fundamental knowledge of low, medium & high resistance and there measuring techniques. 2. To provide students with a fundamental knowledge of Inductor and capacitor and there measuring technique with the help of various A.C. bridges. 3. Different types of Transducers relating with Non Electrical Parameter. 4. To provide students with a fundamental knowledge of IOT and its use in measurement. 5.IOT concepts, IOT Standards Components of IOT System.	CO1. The students should be able to Measure low, medium & high Resistances using suitable instruments. CO2. The students should be able to determine the value of inductor and capacitor with the help of A.C. Bridge & they can draw phasor diagram of bridges. CO3. The students should be able to select proper instrument for measurement various Electrical elements. CO4. Understand general concepts of Internet of Things. CO5. Apply design concept to IoT solutions, Analyze various M2M and IoT architectures

Unit I: Electrical Measurement: **CO1**

Electrical quantity (Resistance, Inductance, Capacitance and frequency) Classification of resistances (low, medium and high), Ammeter Voltmeter method, Megger, Measurement of inductance and capacitance by AC bridges: Hay's, Maxwell's, Anderson, Schering Bridge, Owen's bridge, De-sauty bridge, Wein's bridge for measurement of frequency. Operating principle of wattmeter. [7 Hrs]

Unit II: Measuring Instruments: **CO2**

Classification, operation and working principle of PMMC, MI and dynamometer type instruments, controlling, damping and balancing devices, single-phase and three-phase, Electro-dynamometer power factor meter, frequency meters: electrical resonance type, electrodynamometer, Phase sequence meter. Construction and principle of operation of dynamometer and induction type wattmeter [8 Hrs]

Unit III: Measurement System and Transducers: **CO3**

Introduction to Measurement Systems: Elements of Generalized Measurement System. Primary Sensing Elements And Resistive, capacitive, inductive, piezoelectric, photovoltaic, Hall effect transducers, selection of transducers, semiconductor photo-diode, photo transistor, frequency generating transducers, pressure inductive transducers, LVDT, differential output transducer, thermistor, strain gauge, measurement of angular and linear velocity using electrical transducers, AC tachogenerators. [7Hrs]

Unit IV: Introduction to IoT: **CO4**

Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs. [7 Hrs]

Unit V: IOT Protocols and Architecture: **CO5**

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security, IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction. [7 Hrs]

Text Books:

S. No.	Title	Authors	Publisher
1	Electrical and Electronics Measurements and Instrumentation	Purkait, B Biswas, S. Das and C. Koley	McGraw hill
2	A Course In Electrical And Electronics Measurement And Instrumentation	Sawhney	DhanpatRaiPbs.
3	Electronic Instrumentation	H. S. Kalsi	TMH Publications

Reference Books:

S. No.	Title	Authors	Publisher
1	A Course In Electrical And Electronics Measurement And Instrumentation	J. B. Gupta	KatariaPbs
2	Electrical Measurement and Measuring Instruments	Golding	CBS Publication

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SYLLABUS

B.Tech. (Electrical & Electronics Engineering) Fourth Semester

Subject Code:EEE103401	Electrical Machines II	L= 3	T = 0	P = 0	Credits= 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of this course is to provide knowledge about the basic principles, construction and working of synchronous, single and three-phase induction machines. The aim of this course is to give the knowledge of the equivalent circuits, parameter determination, operational constraints, starting mechanisms, conventional speed control methods, various tests and applications of synchronous and induction machines.	On successful completion of the course, the student Will be able to: **CO1** Understand the construction, working principles of synchronous and three-phase induction machines **CO2** Draw the equivalent circuit diagrams under various load conditions **CO3** Analyze the load profile, voltage regulations and efficiency in various operating conditions **CO4** Understand the needs and requirements of various types of machine operations like starting, speed control, tests etc **CO5** Understand the needs and requirements of Three phase induction machine operations like starting, speed control, tests etc

Unit-I Principles of Electrical Rotating Machines: **CO1**

Mechanical speed and frequency relation, , rotating magnetic fields, EMF equation, pitch factor, distribution factor, winding factor, general torque equation. Synchronous Machines I: Theory of non-salient pole synchronous machines, basic synchronous machine models, equivalent circuit and phasor diagrams of synchronous machines, armature reaction, open circuit, short circuit tests on synchronous generators , synchronous reactance, SCR, voltage regulation of alternators by synchronous impedance. [8Hrs]

Unit-II Synchronous Machines II: **CO2**

General input and output characteristics of synchronous generators, Active and reactive power flow, Steady state power angle characteristics of cylindrical rotor synchronous generator, Parallel operation of synchronous generators, load sharing, operation of synchronous generators with infinite bus bars, effect of excitation and prime mover input, synchronizing torque, V-curves and inverted V-curves of synchronous machines. [7Hrs]

Unit-III Synchronous Machines III: **CO3**

Theory of salient pole synchronous machines, two-reaction theory, phasor diagram, power angle characteristics of salient pole synchronous motor, stiffness of coupling, synchronous condenser, Hunting in synchronous machines, damper winding, starting of synchronous motor. [7Hrs]

Unit-IV Three-phase Induction Machines-I: **CO4**

Introduction, construction (Cage and slip-ring induction motors), principle of operation, equivalent circuit, phasor diagram, torque and power output, torque-speed (slip) relationship, loss and efficiency estimation, No-load and block rotor test, circle diagram, Methods of starting of Induction motor – Direct – on - line, star-delta. [7Hrs]

Unit-V Three-phase Induction Machines-II **CO5**

Speed control of induction motor (stator voltage control, rotor resistance control, frequency control or v/f control), cogging and crawling. [7Hrs]

Single –Phase Induction Motor Double revolving field theory of single phase induction motor, starting and running performance of single phase induction motor (elementary analysis only), Different types of single phase induction motors (Resistance split phase, Capacitor split phase, Shaded Pole) [7Hrs]

Text Books:

S. No.	Title	Authors	Publisher
1	Electric Machines	Nagrath& Kothari,	McGraw Hill Publications
2	Electrical Machinery	P. S. Bimbhra	Khanna Publishers

Reference Books:

S. No.	Title	Authors	Publisher
1	Electrical Machines	Chakrabarti&Debnath	McGraw Hill Publications
2	Electrical machines	B. R, Gupta	New Age International
3	Performance and design of AC machines	M.G. Say	CBS Publication

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SYLLABUS

B.Tech. (Electrical & Electronics Engineering) Fourth Semester

Subject Code : EEE103491	Digital Electronics Lab	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	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) [24Hrs]

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	Publisher
1.	Digital Logic and Computer Design	M. Morris Mano	Pearson Education India
2.	Modern Digital Electronics	R. P. Jain	McGraw Hill Education

Subject Code : EEE103493	Electrical Machines-II Laboratory	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25	--	25	50	--

List of Experiment: [24Hrs]

1. To study squirrel cage & slip ring type Induction motor and Synchronous motor with the help of Cut-view model or Dismantled Motor.
2. To plot the magnetization characteristic of a three phase alternator
3. To determine the voltage regulation of 3 phase alternator by EMF method.
4. To determine the voltage regulation of 3 phase alternator by ZPF method.
5. To determine the voltage regulation of 3 phase alternator by Direct Loading.
6. To plot the V and inverted V- curve of synchronous Motor at No Load, and Full Load.
7. To perform synchronization of alternator with infinite bus by bright lamp method.
8. To determine Xd&Xq of a salient pole rotor type synchronous machine by slip test.
9. To determine the equivalent circuit parameters of 3-phase induction motor by No-Load &Block Rotor test
10. To Study DOL starter and provide connection to 3- phase Induction motor.
11. To study Contactor type starter for Forward/ Reverse operation of Induction motor
12. To study the speed control of a three phase slip ring I.M by adding external resistance to the rotor circuit.
13. To find Full load Efficiency of Induction Motor by drawing Circle Diagram.
14. Measurement of Speed of Induction Motor by Measuring Rotor Frequency.
15. To Study the starting methods of single phase Induction motor.

Subject Code: EEE103493	IOT & Instrumentation lab	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25	--	25	50	--

List of Experiment: [24Hrs]

1. To determine unknown inductance of a given coil by Maxwell Bridge Method.
2. To determine the inductance of the given coil by Anderson Bridge Method.
3. To determine unknown capacitance of a given capacitor by Desauty Bridge Method.
4. To determine capacitance of a given capacitor by Schering Bridge Method.
5. To determine the inductance by Owen's Bridge Method.
6. To determine unknown inductance by Hay Bridge Method.
7. To design a Digital DC Voltmeter and Ammeter to measure the voltage and current in DC electrical circuits using Arduino and display the values in LCD display.
8. To design a Digital AC Voltmeter and Ammeter to measure the voltage and current in AC electrical circuits using Arduino and display the values in LCD display.
9. To design a Digital frequency meter to measure the frequency in any AC electrical circuit using Arduino and display the values in LCD display.
10. To measure the power and energy in electrical circuit using Arduino and display the values in LCD display.
11. To measure the phase shift and power factor in an electrical circuit for different loads using Arduino and display the value in LCD display.
12. To design a traffic control system using IOT.

Equipment/Machines/Instruments/Tools/Software Required:

Bridges, Head Phone, Transformer, Variac, Voltmeter, Ammeter, Multimeters, Resistors, DC Supply, Meggar, Arduino Uno, Computer with Arduino IDE software.

Recommended Book:

1. Electrical measurement & measuring instrument by A.K.Sawhney.
2. Electrical measurement & measuring instrument by J.B.Gupta
3. Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence by Jan Holler, VlasiosTsiatsis, Catherine Mulligan

Subject Code : EEE103494	Mini Project-II/ Industrial Automation Lab	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25	--	25	50	--

List of Experiment: [24Hrs]

1. Program PLC ladder logic for logic gates (AND, OR, NOT, NAND, NOR, XOR and XNOR)
2. Program PLC ladder logic for Boolean expression
3. To study fail safe concept on PLC programming
4. PLC On-Delay Timer Instruction
5. PLC Off-Delay Timer Instruction
6. PLC Count-Up Instruction
7. PLC Count-Down Instruction
8. Motor forward and reverse direction control using PLC
9. To study PLC input module and output module Structure
10. To study addressing in PLC programming

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SYLLABUS

B.Tech. (Electrical & Electronics Engineering) Fourth Semester

SUBJECT: BIOLOGY FOR ENGINEERS

Subject Code	AC100492	L = 0	T = 0	P = 0	Credits = 0
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	Workshop ,Quiz, Seminar And By Organize Guest Lecture	-	25	25	-

Course Objectives	Course Outcomes
The objective of this course is to impart an understanding of fundamentals of biological systems and its applications towards industries to solve the problems in the real life. • To convey that Biology is as important scientific discipline as Mathematics, Physics, Chemistry, and Engineering and technology. • To convey that classification per seis not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Discuss the concept human genetics. • 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 • How to analyses biological processes at the reductionist level. Concept of Energy change. • The fundamental concept and principles of Microbiology	**On successful completion of the course, the student will be able to:** **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) Habitataacquatic or terrestrial (f) 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. **[3Hrs.]**

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 (Glycolsis 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, **[3 Hrs.]**

Text Books:

S. No.	Title	Author(s)	Publisher
1.	Bology: 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
6	Biology for engineers and other non biologist.	Prof. Suraishkumar&Prof Madhulika Dixit	IIT madras

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