FACULTY OF ENGINEERING

Scheme of Instruction & Examination

and

Syllabi

B.E. III and IV Semester

of

Four Year Degree Programme

In

Electrical & Electronics Engineering

(With effect from the academic year 2017 – 2018)

Issued by

Dean, Faculty of Engineering

Osmania University, Hyderabad

July 2017

SCHEME OF INSTRUCTION & EXAMINATION
B.E. III – Semester
(ELECTRICAL AND ELECTRONICS ENGINEERING)

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	Pr/ Drg	Contact Hrs/Wk	CIE	SEE	Duration in Hrs	
Theory Courses										
1.	BS301MT	Engineering Mathematics – III	3	1	-	4	30	70	3	3
2.	ES322EC	Electronic Engineering-II	3	-	-	3	30	70	3	3
3.	ES323ME	Prime Movers & Pumps	3	-	-	3	30	70	3	3
4.	PC301EE	Electrical Circuits – I	3	1	-	4	30	70	3	3
5.	PC302EE	Electromagnetic Fields	3	1	-	4	30	70	3	3
6.	PC303EE	Digital Electronics & Logic Design	3	-	-	3	30	70	3	3
7.	MC916CE	Environmental Sciences	3	-	-	3	30	70	3	3
Practical / Laboratory Courses										
8.	ES361ME	Mechanical Engineering Lab.	-	-	2	2	25	50	3	1
9.	ES 362 EC	Electronics Engineering Lab	-	-	2	2	25	50	3	1
			21	**3**	**4**	**28**	**230**	**520**		**23**

Engineering Service Courses offered to other Departments

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	Pr/ Drg	Contact Hrs/Wk	CIE	SEE	Duration in Hrs	
Theory Courses										
1.	ES321EE	Part - A Electrical Technology (For Civil Engg)	2	-	-	2	15	35	2	2
2.	ES323EE	Automotive Electrical and Electronics Engineering (Automobile Engg.)	3	-	-	3	30	70	3	3
Practical /Laboratory Courses										
3.	ES361EE	Electrical Engineering Lab (For ECE and CSE)	-	-	2	2	25	50	3	1
4.	ES362EE	Electrical Wiring and Microprocessor Lab (AE)	-	-	2	2	25	50	3	1

BS: Basic Sciences ES: Engineering Sciences MC: Mandatory Course
PC: Professional Course HS: Humanities and Sciences
L: Lectures T: Tutorials Pr : Practicals Drg: Drawing
CIE: Continuous Internal Evaluation **SEE:** Semester End Examination (Univ. Exam)

Note: 1) Each contact hour is a Clock Hour
2) The practical class can be of two and half hour (clock hours) duration as per the requirement of a particular laboratory.

Course Code	Course Title						Core / Elective
BS 301 MT	**Engineering Mathematics – III** (Common to all branches)						
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Core**
	L	**T**	**D**	**P**			**Credits**
NIL	**3**	**1**	**0**	**0**	**30**	**70**	**3**

Course Objectives

- To introduce the concept of functions of complex variables and their properties
- To formulate partial differential equations and to introduce a few methods to solve first order linear and non-linear partial differential equations
- To study Fourier series and its applications to partial differential equations

Course Outcomes

At the end of the course students will be able to

- determine the analyticity of a complex functions and expand functions as Taylor and Laurent series
- evaluate complex and real integrals using residue theorem
- expand function as a Fourier series
- find solutions of first order and second order partial differential equations
-

UNIT-I

Functions of Complex Variables: Limits and continuity of function, differentiability and analyticity, necessary & sufficient conditions for a function to be analytic, Cauchy-Reimann equations in polar form, harmonic functions, complex integration, Cauchy's integral theorem, extension of Cauchy's integral theorem for multiply connected regions, Cauchy's integral formula, Cauchy's formula for derivatives and their applications.

UNIT - II

Residue Calculus: Power series, Taylor's series, Laurent's series, zeros and singularities, residues, residue theorem, evaluation of real integrals using residue theorem, bilinear transformation, conformal mapping.

UNIT - III

Fourier Series: Fourier series, Fourier series expansions of even and odd functions, convergence of Fourier series, Fourier half range series.

UNIT - IV

Partial Differential Equations: Formation of first and second order partial differential equations, solution of first order equations, Lagrange's equation, Nonlinear first order equations, Charpit's method, higher order linear equations with constant coefficients.

UNIT - V

Fourier Series Applications to Partial Differential Equations: Classification of linear second order partial differential equations, separation of variables method (Fourier method), Fourier series solution of one dimensional heat and wave equations, Laplace's equation.

Suggested Reading:

1) R.K.Jain, S.R.K Iyengar, *Advanced Engineering Mathematics,* Narosa Publication , 4th Edition, 2014.
2) B.S.Grewal, *Higher Engineering Mathematics,* Khanna Publications , 43rd Edition, 2014.
3) Gupta, Kapoor, *Fundamentals of Mathematical statistics,* Sultan chand & sons, New Delhi, *2014.*
4) Erwin Kreyszig, *Advanced Engineering Mathematics* , 9th Edition, 2012.
5) James Brown, Ruel Churchill, *Complex variables and Applications* , 9th Edition,2013.

Course Code	Course Title						Core / Elective
ES322EC	Electronic Engineering – II						Core
Prerequisite	Contact Hours per Week				CIE	SEE	
	L	T	D	P			Credits
NIL	3	0	0	0	30	70	3

Course Objectives:

- Identify the components that effect the frequency response and analyze the single and multi stage amplifiers.
- Recognize the type of feedback and analyze its effect on amplifier's characteristics.
- Calculate the frequency of oscillation for different types of oscillator circuits suited for various applications using Barkhausen's criterion.
- Identify the importance of power amplifiers and calculate the efficiencies of class -A, B, AB and examine the effect on distortion. Identify the linear and non-linear wave shaping circuits for various waveforms & analyze their response

.**Course Outcomes**

- Ability to design feedback amplifiers ckt with its applications.
- Ability to analyze and design various oscillators.
- Ability to design power amplifier for various applications.
- Ability to design various filters required.
- Ability to design clipping and clamping circuits and various multi-vibrators.

UNIT-I

Multistage amplifiers: Classification of amplifiers, Low, mid and high Frequency response of single stage RC coupled amplifiers, step response of amplifier. Cascading of amplifier. Interacting and non interacting amplifiers, effect of cascading on gain and Bandwidth.

UNIT-II

Feedback Amplifiers: The feedback concept, General characteristics of negative feedback amplifier, Effect of negative feedback on input and output impedances, Voltage and current, series and shunt feedbacks. Stability considerations, Local Versus global feedback.

UNIT-III

Oscillators: Barkhausen's Criterion, RC oscillator, Weinbridge, Phase shift, LC Hartley and colpitts oscillator, Crystal controlled oscillator, (Analysis oscillators using BJTs only) frequency stability of oscillator.

UNIT-IV

Large Signal Amplifiers: BJTas large signal audio amplifiers. Classes of operation, Harmonic distortion, power dissipation, efficiency calculations. Design considerations of

transformer coupled and transform less push-pull audio power amplifiers under Class-A. Class-B, Class D and Class-AB operations

UNIT-V

Wave-Shaping Circuits: RC Low Pass and High Pass circuit, response to Step, Pulse, Ramp and square wave inputs, Differentiating and Integrating circuits using diode, Clipping Circuits for Single level and two levels, Clamping Circuits.

Suggested Reading:

1. Jacob Millman, Christos Halkias, Satyabrata jit, Electronics Devices and circuits ,3rd ed.,McGra\v Hill Education (India) Private Limited, 2010.
2. Jacob Millman, Christos Halkias, Chetan Parikh, Integrated Electronics, 2nd ed., McGraw Hill Education (India) Private Limited, 2011.
3. Donald L Schilling & Charles Belove, Electronics Circuits, Discrete & Integrated, 3rd ed., McGraw Hill Education (India) Private Limited, 2002.
4. Jacob Millman and Herbert Taub, Pulse, Digital and Switching waveforms, 3rd ed., McGraw Hill Education (India) Private Limited, 2011.

Course Code	Course Title						Core / Elective
ES323ME	PRIME MOVERS AND PUMPS						Core
Prerequisite	Contact Hours per Week				CIE	SEE	
	L	T	D	P			Credits
NIL	3	0	0	0	30	70	3

Course Objectives

It is intended to make the students

- To acquire fundamental knowledge of fluid mechanics and the governing equations applied to fluid machinery.
- To understand the basic types of hydraulic turbines, their components calculations involved in power output and performance characteristics of turbines.
- To understand the mechanism involved in steam formation, types of steam generators; basic working principle of steam engines.
- To understand the basic cycles, principles involved in operation of different types of steam turbines and gas turbines.
- To understand the basic differences between positive displacement and roto dynamic pumps, their working principles and performance characteristics of reciprocating and centrifugal pumps.

Course Outcomes

After the end of the course the student will be able to

- Get a quick look into fundamental aspects of fluid mechanics with basic knowledge acquired to conduct preliminary calculations applied to fluid machinery.
- Understand the basic types of hydraulic turbines, their components, operation and their rated and off design performance characteristics.
- Explain basic principles involved in steam formation, types of steam boilers, working of steam engines.
- Familiarizes basic knowledge of working of steam turbine, gas turbine and methods of improving their efficiency.
- Understand the working principle of reciprocating pumps and centrifugal pumps, their performance over wide range of operations and about the negative effects of cavitation on pump performance.

Unit-I

Fluid Mechanics: Newtonian and Non-Newtonian Fluids, viscosity, types of fluid flows, continuity, momentum and energy equations, Bernoulli's equation and its applications, laminar and turbulent flows, Reynolds number and its significance.

Unit-II

Hydraulic Turbines: Classification and working principles of turbines Pelton, Francis, and Kaplan turbine, function of draft tube and types of draft tubes, unit quantities, performance and characteristic curves.

Unit-III

Generation of steam: Dryness fraction and properties of steam, function of boilers, working principle of Lancashire boiler, Babcock and Wilcox boiler, boiler mounting and accessories.

Steam engines: Rankine and Modified Rankine cycle for steam engines.

Unit-IV

Steam turbines: Classification of steam turbines, compounding of steam turbines, pressure compounding, velocity compounding, and pressure-velocity compounding.

Gas turbine: Classification of gas turbine-constant pressure combustion cycle, closed cycle and constant volume combustion gas turbine plants.

Unit-V

Pumps: Reciprocating pumps, working of single and double acting types, effect of acceleration head and friction, use of air vessels, work done and power required without and with air vessels

Centrifugal pumps: Classification and working of centrifugal pumps, need for priming, cavitation and its effect on performance

Suggested Reading

1. Ballaney P. L, “Thermal Engineering”, Khanna Publishers, 19th Edn., 1993.
2. Yadav R, "Steam and Gas turbines”, Galgotia Publishers, 6th Edn., 1992.
3. Rajput., “Thermal Engineering”, Laxmi Publications (P) Ltd, New Delhi.
4. Bansal R.K., “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications (P) ltd, New Delhi.
5. Kumar D.S, "Fluid Mechanics and Fluid Power Engineering", S.K. Kataria & Sons
6. S.Ramamrutham,Hydraulic Machines.Dhanpat Raiand Sons.2004.

Course Code	Course Title						Core / Elective
PC301EE	Electrical Circuits - I						
Prerequisite	Contact Hours per Week				CIE	SEE	Core
	L	T	D	P			Credits
NIL	3	1	0	0	30	70	3

Course Objectives

- To acquire knowledge in circuits and to understand the fundamentals of derived circuit laws.
- To understand theorems, steady state and transient analysis of single phase and 3-phase circuits.

Course Outcomes

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

- Understand network analysis, techniques using mesh and node analysis.
- Evaluate steady state and transient behavior of single port network for DC and AC excitations.
- Analyze electric circuits using network theorems.
- Understand the concept of coupled circuits and poly-phase circuits.

UNIT-I

Network Elements & Laws: Active elements, Independent and dependent sources. Passive elements — R, L and C, Energy stored in inductance and capacitance, Kirchhoff's laws, Source transformations, Star-delta transformations, Node voltage method, Mesh current method including super node and super mesh analysis.

UNIT-II

Single-Phase Circuits: RMS and average values of periodic sinusoidal and non-sinusoidal waveforms, Phasor representation, Steady-state response of series, parallel and series-parallel circuits. Impedance, Admittance, Current locus diagrams of RL and RC series and parallel circuits with variation of various parameters. Resonance: Series and parallel circuits, Band-width and Q-factor.

UNIT-III

Network theorems: Superposition theorem, Thevinin's theorem, Norton's theorems, Maximum power transfer theorem, Tellegen's theorem, Compensation theorem, Millrnan's theorem and Reciprocity theorem.(AC & DC)

UNIT-IV

Poly-phase Circuits: Analysis of balanced and unbalanced 3-phase circuits, Star and delta connections, Measurement of three-phase power for balanced and unbalanced loads.
Coupled circuits : Concept of self and mutual inductance, Dot convention, Coefficient of coupling, Analysis of circuits with mutual inductance.

UNIT-V

Transient analysis: Transient response of RLC circuits, Formulation of integrodifferential equations, Initial conditions, Response of RL, RC and RLC networks subjected to internal energy, Response to impulse, step, ramp, exponential and sinusoidal excitations

Suggested Reading:

1) Van Valkenburg M.E., *Network Analysis*, Prentice Hall of India, 3rd Edition, 2000.
2) William Hayt H, Kimmerly Jack E, Steven Durbin M, *Engineering Circuit Analysis*, McGraw Hill, 6th Edition, 2002.
3) 3. Jagan N.C, Lakshrninarayana C., *Network Analysis*, B.S. Publications, 3rd Edition, 2014.

Course Code	Course Title						Core / Elective
PC302EE	Electromagnetic Fields						Core
Prerequisite	Contact Hours per Week				CIE	SEE	
	L	T	D	P			Credits
NIL	3	1	0	0	30	70	3

Course Objectives

- To be able to understand the concepts of electrostatic fields, magneto static fields, electromagnetic waves and Maxwell's equation.
- To understand the concepts of electromagnetic wave propagation in different media.

Course Outcomes

At the end of the course students will be able to

- Formulate problems within electrostatics, magnetostatics and stationary current distributions in linear, isotropic media.
- Derive expressions for the energy for electrostatic and magnetostatic fields, and derive Poyntings theorem.
- Calculate the boundary conditions for electric and magnetic fields between different media.
- Calculate the reflection and refraction coefficients of electromagnetic waves for different conditions.

UNIT-I

Review of Vector Analysis: Coulomb's Law, Electric field intensity, Electric field due to different charge distributions. Electric field due to line charge, Sheet charge, Volume charge distribution, Electric flux density, Gauss's law, Divergence theorem,. Potential, Potential gradient, Potential field of different charge distributions, Applications of above laws.

UNIT-II

Energy in electrostatic field, Poisson's and Laplace equations, Uniqueness theorem, Solution of Laplace's equation, Conductors, Dielectric capacitance, Conductor properties and Boundary conditions, Calculation of capacitance, Boundary conditions for conductors and perfect dielectric materials.

UNIT-III

Steady magnetic field, Biot-Savart's law, Ampere's law, Stoke's theorem, Magnetic scalar vector potential Faraday's law, Magnetic boundary conditions, Self and Mutual inductances, Force on moving charge, Force on differential elements, Magnetic circuits, Analogy with electrical circuits, Applications of above laws.

UNIT-IV

Maxwell's equations in Integral form, Line and surface integrals, Application to static fields, Boundary conditions, Maxwell's equations in differential forms, Continuity equation, Potential function for static fields, Field equations in vector forms, energy storage in electric and magnetic fields.

UNIT-V

EM waves in homogeneous medium solutions for free space conditions, Uniform plane wave propagation, Poisson's and Laplace's equations, Sinusoidally time varying uniform plane waves in free space, Uniform plane waves in dielectrics and conductors, Poynting vector, Power dissipation, Reflection of uniform plane waves, Introduction to method of moments, Method of images.

Suggested Reading:

1. Matthew Sadiku N.O., *Elements of Electromagnetics*, Oxford University Press, 4th Edition, 2006.
2. William. Hayt H, Buck John A., *Engineering Electromagnetics*, Tata McGraw Hill, 7th Edition, 2003.
3. Nannapaneni Narayana Rao, *Elements of Engineering Electromagnetics*, PHI, New Delhi, 5th Edition, 2002.

Course Code	Course Title						Core / Elective
PC303EE	Digital Electronics & Logic Design						Core
Prerequisite	Contact Hours per Week				CIE	SEE	
	L	T	D	P			Credits
NIL	3	0	0	0	30	70	3

Course Objectives

- To be able to understand the principles of digital systems and binary arithmetic circuits.
- To study the properties and realization of various logic gates, A/D and D/A converters.

Course Outcomes

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

- Differentiate the number system, convert and compare a number system to another number systems used in digital logic design.
- Understand Boolean algebra and its application to DeMorgan's theorems and karnaugh map reduction method.
- Analyze and design various digital combinational circuits

UNIT-I

Boolean algebras and combinational logic, AND, OR and NOT operations. Laws of Boolean algebra, Minimization of Boolean expressions, Truth tables and maps. Sum of products and product of sums, Map method of reduction, Incompletely specified functions, Multiple output minimization.

UNIT-II

Tabular minimization, Digital logic families and IC's, Characteristics of Digital IC's, Introduction to RTL, DTL, TTL, CMOS, ECL families, Details of TTL logic family, Totem pole, Open collector outputs, wired AND Operation, Comparison of performance, TTL sub-families, Multiplexer and dc-multiplexer, Encoder and decoder, Code converters, Implementation of combinational logic using standard logic gates and multiplexers.

UNIT-III

Binary arithmetic and circuits, Half and Full adder, Subtractor and Magnitude comparator, Number complements, Two's complement arithmetic, Carry look ahead adder, Decimal numbers and their codes, BCD and Excess -3 arithmetic

UNIT-IV

Synchronous Sequential Circuits: basic latch circuits, Debouncing switch, SR, JK, D and T flip-flops, Truth table and execution table, Ripple and Synchronous counters, Up/down counters, General BCD counter, Shift registers, ring counters

UNIT-V

A/D and D/A Converters: Converter types — Tracking type, Flash type, Successive approximation type: R-2R ladder, Weighed register type, Switched current source type, Switched capacitor type

Suggested Reading:

1. Anand Kumar A., *Fundamentals of Digital Circuits*, Prentice Hall of India, 4th Edition, 2003
2. Morriss Mano M., *Digital Design*, Prentice Hall of India, 3rd Edition, 2002.
3. Zvykohavi, *Switching & Finite Automata Theory*, Tata McGraw Hill, 2nd Edition, 1991

Course Code	Course Title						Core / Elective
MC916CE	Environmental Sciences						Core
Prerequisite	Contact Hours per Week				CIE	SEE	
	L	T	D	P			Credits
NIL	3	0	0	0	30	70	3

Course Objectives

- To study the basic concepts, sources of water, floods and their impact on environment
- To know the ecosystems and energy resource systems
- To understand the Biodiversity concepts and their advantages
- To study the different pollutions and their impact on environment
- To know the social and environment related issues and their preventive measures

Course Outcomes

At the end of the course students will be able to

UNIT-I

Environmental Studies: Definition, scope and importance, need for public awareness.
Natural resources: Water resources; use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams:benefits and problems. Effects of modern agriculture, fertilizer- pesticide problems, water logging and salinity.

UNIT-II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).
Energy resources: Growing energy needs, renewable and non-renewable energy sources. Land Resources, land as a resource, land degradation, soil erosion and desertification.

UNIT-III

Biodiversity: Genetic species and ecosystem diversity, bio-geographical classification of India. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT-IV

Environmental Pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution; solid and liquid waste management.
Environment Protection Act: Air, water, forest and wild life Acts, enforcement of environmental legislation.

UNIT-V

Social Issues and the Environment: Water conservation, watershed management, and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.

Environmental Disaster Management: Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology. Disaster management cycle, and disaster management in India.

Suggested Reading:

1. A.K. De "*Environmental Chemistry*", Wiley Eastern Ltd.
2. E.P. Odum "*Fundamentals of Ecology*", W.B. Sunders Co., USA.
3. M.N. Rao and A.K. Datta "*Waste Water Treatment*", Oxford and IBK Publications.
4. Benny Joseph "*Environmental Studies*", Tata McGraw Hill, 2005.
5. V.K. Sharma "*Disaster Management*", National Centre for Disaster Management, IIPE, Delhi,1999.
6. "Green Building Council of India", Teri Document.

Course Code	Course Title						Core / Elective
ES361ME	Mechanical Engineering Lab						Core
Prerequisite	Contact Hours per Week				CIE	SEE	
	L	T	D	P			Credits
NIL	0	0	0	2	25	50	1

Course Objectives

- To gain knowledge of working of petrol and diesel engines
- To be able to estimate the power developed in the engine
- To understand the working principle of hydraulic turbines and pumps
- To understand the performance of turbines using characteristic curves
- To gain the knowledge of various flow meters and the concept of fluid mechanics

Course Outcomes

- Knowledge regarding components and functioning of engines
- Ability to calculate the power developed, losses in the engines
- Understanding of viscosity of oils
- Knowledge of flash and fire point of oils, and its importance
- Knowledge of estimating the power of turbines and pumps

a) Thermal Engineering Laboratory:

1. Flash and Fire point test.
2. Performance test on diesel engine
3. Valve timing diagram test on a I.C engine
4. Morse test on multi-cylinder petrol engine.
5. Heat balance test on diesel engine.
6. Performance test on VCR engine

b) Hydraulic Machinery Laboratory:

7. Performance test on Pelton wheel turbine.
8. Characteristics curves test on Pelton wheel turbine.
9. Performance test on Francis turbine.
10. Characteristics curves test on Francis turbine.
11. Performance test on Turgo wheel.
12. Characteristics curves test on Turgo wheel.
13. Performance test on Reciprocating pump.

Note: *At least ten experiments should be conducted in the Semester*

Course Code	Course Title						Core / Elective
ES362EC	Electronic Engineering Lab						Core
Prerequisite	Contact Hours per Week				CIE	SEE	
	L	T	D	P			Credits
NIL	0	0	0	2	25	50	1

Course Objectives:

- Designing basic circuits of rectification with and without filters using diodes
- Designing wave shaping circuit using diodes.
- Designing of single and multistage amplifier circuits.
- Use of negative feedback in amplifier circuits.
- Use of positive feedback in Oscillators.

List of Experiments:

1. Characteristics of Silicon, Germanium and Zener Diode in forward bias and reverse bias
2. Application of diode as a full wave rectifier with and without filters. Calculation of Ripple factor, voltage regulation and efficiency with various loads
3. Static characteristics of BJT in CE configuration
4. Static characteristics of JFET in CS configuration
5. Frequency response of Single and two stage BJT amplifier in CE configuration
6. Voltage series amplifier without and with feedback
7. Voltage shunt amplifier without and with feedback.
8. Current shunt amplifier without and with feedback.
9. LC Oscillators: Hartley Oscillator and Colpitts Oscillator.
10. RC Phase Oscillator and Wein Bridge Oscillator.
11. Power Amplifier
12. Clipping circuits
13. Clamping Circuits.

NOTE: A minimum of any 10 experiments to be performed

Suggested Reading:

1. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, *Basic Electronics, A text-Lab Manual*, 7th Edition. Mc- Graw- Hill Higher Education 2001.

Course Code	Course Title						Core / Elective
ES321EE	Part A: Electrical Technology (For Civil Engg.)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	
	L	T	D	P			Credits
NIL	2	0	0	0	15	35	2

Course Objectives

- To acquire knowledge in electrical circuits.
- To be able to understand the basic principle operation of electrical machines.

Course Outcomes

- Students will know the basics of Electrical Engineering with good knowledge on underlying principles of operation
- Students can relate these basics with daily experiences

UNIT I

DC Circuits: Ohm's law, Kirchhoff's laws, Resistance networks, Series, Parallel and Series-parallel circuits, Power loss in resistive elements.

AC Circuits: Principles of production of ac waveform, frequency, effective value and form factor, Phasor representation, Behaviour of pure resistance, inductance, and capacitance with ac sinusoidal source, Impedance and simple ac networks with R, L and C elements.

UNIT II

Three Phase Circuits: Star and Delta connections under balanced conditions, Line & phase Voltages and currents and three phase power.

Working principle of single phase energy meter.

Basic principles of DC generator and motor.

UNIT III

Transformers: Principle and working of single phase transformer under no-load and load conditions, O.C & S.C tests, Losses & efficiency, voltage regulation.

Three phase Induction Motors: Rotating magnetic field, Torque-slip characteristics, Starting methods – DOL starter, Star/Delta starter.

Basic idea and applications of single phase induction motors – Capacitor start 1-phase induction motor.

Suggested Reading:

1. Mehta V.K., *Principles of Electrical Engineering and Electronics*, S.Chand & Co., 1999
2. John Bird, *Electrical Circuit theory and Technology*, Routledge Taylor & Francis Group, Fourth Edition, 2012.
3. Naidu M.S, Kamakshiah S., *Introduction to Electrical Engineering*, Tata McGraw Hill, 1995.
4. A.Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "*Basic Electrical Engineering*" Tata McGraw Hill Education PVT LTD, 2009.

Course Code	Course Title						Core / Elective
ES323EE	Automotive Electrical and Electronics Engg. (For Automobile Engg.)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	
	L	T	D	P			Credits
NIL	3	0	0	0	30	70	3

Course Objectives

It is intended to make the students to

- Understand the principle and construction of batteries and accessories
- To know the working of different starter drive units.
- To understand the charging system and the working of its units.
- To know the fundamentals of auto motive electronics.
- To know working of sensors and activators & microprocessor.

Course Outcomes

After the completion of this unit, the student is able to

- Explain the principle and construction of batteries and accessories.
- Demonstrate the working of different starter drive units.
- Distinguish between the different units of charging system.
- Apply electronics for different automobile systems.
- Apply different sensors and microprocessors for the measurement of operating parameters of an automobile.

UNIT-I

Batteries And Accessories: Principle and construction of lead acid battery, characteristics of battery, rating capacity and efficiency of batteries various tests on batteries, maintenance and charging. Lighting system: insulated and earth return system, details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.

UNIT-II

Starting System : Condition at starting, behavior of starter during starting, series motor and its characteristics, principle and construction of starter motor, working of different starter drive units, care and maintenance of starter motor, starter switches.

UNIT-III

Charging System : Generation of direct current, shunt generator characteristics, armature reaction, third brush regulation, cutout, voltage and current regulators, compensated voltage regulator, alternators principle and constructional aspects and bridge rectifiers, new developments.

UNIT-IV

Fundamentals Of Automotive Electronics : Current trends in automotive electronic engine management system, electro magnetic interference suppression, electromagnetic compatibility, electronic dashboard instruments, onboard diagnostic system, security and warning system.

UNIT-V

Sensors And Activators : Types of sensors: Sensor for speed, throttled position, exhaust oxygen level, manifold pressure, crankshaft position, coolant temperature, exhaust temperature, air mass flow for engine application. Solenoids, stepper motors relay. Introduction to Microprocessor & Applications in Automobiles.

Suggested Reading

1. Young A.P. & Griffiths. L. "Automotive Electrical Equipment", ELBS & New Press - 1999.
2. William B. Riddens "Understanding Automotive Electronics", 5th edition – Butter worth Heinemann Woburn, 1998.
3. Bechhold "Understanding Automotive Electronics", SAE, 1998.
4. Crouse, W.H "Automobile Electrical Equipment", McGraw-Hill Book Co., Inc., New York, 3rd edition, 1986.

<table>
<tr><th>Course Code</th><th colspan="6">Course Title</th><th>Core / Elective</th></tr>
<tr><td>ES361EE</td><td colspan="6">Electrical Engineering Lab
(Common for ECE & CSE)</td><td rowspan="2">Core</td></tr>
<tr><td rowspan="2">Prerequisite</td><td colspan="4">Contact Hours per Week</td><td rowspan="2">CIE</td><td rowspan="2">SEE</td></tr>
<tr><td>L</td><td>T</td><td>D</td><td>P</td><td>Credits</td></tr>
<tr><td>NIL</td><td>0</td><td>0</td><td>0</td><td>2</td><td>25</td><td>50</td><td>1</td></tr>
<tr><td colspan="8">Course Objectives
➢ To learn practical electric AC & DC circuits.
➢ To learn operation and performance characteristics of electrical machines by conducting various tests practically.

Course Outcomes
➢ Awareness about various electric safety rules to be followed while working with electrical equipments
➢ Explore themselves in designing basic electric circuits
➢ Identify requirements for electric machines for domestic and industrial purpose</td></tr>
</table>

List of Experiments:

1. Verification of Kirchhoff's Laws.
2. Verification of Thevinin's and Norton's Theorems.
3. Study of Three-Phase Balanced Circuits.
4. Measurement of Power by Two-Wattmeter Method.
5. Study of Single-Phase RLC Series Circuits.
6. Magnetization Curve of a Separately Excited DC Generator.
7. Load Characteristics of Shunt Generator.
8. Performance Characteristics of Shunt Motor.
9. Speed Control of DC Shunt Motor.
10. O.C and S.C Tests on Single-Phase Transformer.

1 1. Load Test on Single-Phase Transformer.

12. Load Test on Three-Phase Induction Motor.

Note: Atleast ten experiments should be conducted in the Semester..

Course Code	Course Title						Core / Elective
ES362EE	**Electrical Wiring and Microprocessor Lab (For Automobile Engg)**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	
	L	**T**	**D**	**P**			**Credits**
NIL	**0**	**0**	**0**	**2**	**25**	**50**	**1**

Course Objectives

It is intended to make the students

1. To learn the testing and maintenance of batteries, starting motors and regulator.
2. To know the diagnosis of Ignition System and automobile electrical wiring.
3. To understand the Block Transfer, 8 bit addition & Subtraction Stepper Motor Interfacing.

List of Experiments:

Electrical Laboratory

1. Testing of batteries and battery maintenance
2. Testing of starting motors and generators
3. Testing of regulators and cut –outs
4. Diagnosis of ignition system faults
5. Study of Automobile electrical wiring.

Microprocessor

1. Block Transfer
2. 8 bit Addition, Subtraction
3. Multiplication and Division
4. Maximum and Minimum of block of data
5. Sorting
6. Stepper Motor Intefacing