DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15

(An Autonomous Institute under Kakatiya University, Warangal)

SCHEME OF INSTRUCTIONS & EVALUATION

III-SEMESTER OF 4-YEAR B.TECH. DEGREE PROGRAMME

(6Th+3P)

Sl.No	Course Category	Course Code	Course Name	Periods/week			Credits	Evaluation Scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	BSC	U18MH301	Engineering Mathematics - III	3	1	-	4	10	30	40	60	100
2	HSMC	U18TP302	Soft and Interpersonal Skills	-	-	2	1	100	-	100	-	100
3	PCC	U18EE303	Network Theory	3	1	-	4	10	30	40	60	100
4	PCC	U18EE304	Electrical Measurements & Instrumentation	3	-	-	3	10	30	40	60	100
5	PCC	U18EE305	Electromagnetic Fields	3	-	-	3	10	30	40	60	100
6	PCC	U18EC310	Electronic Devices and Circuits	3	-	-	3	10	30	40	60	100
7	PCC	U18EE307	Electrical Measurements & Instrumentation Laboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18EE308	Networks & Simulation Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18EC311	Electronic Devices and Circuits Laboratory	-	-	2	1	40	-	40	60	100
			Total	**15**	**2**	**8**	**21**	**180**	**180**	**360**	**540**	**900**

Note: L - Lectures; T – Tutorials; P – Practicals; CIE – Continuous Internal Evaluation; TA – Teachers Assessment; MSE – Mid Semester Examination; ESE – End Semester Examination;

Student Contact Hours/Week : 25

Total Credits(C) : 21

U18MH301 ENGINEERING MATHEMATICS-III

Class: B.Tech.III-Semester **Branch:** Common to allbranches

Teaching Scheme:

L	T	P	C
3	1	–	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : Laplace transforms to solve certain differential equations
LO2 : representing a function as a Fourier series in the given interval
LO3 : complex analytic functions and their applications
LO4 : complex integral theorems to evaluate certain real integrals

UNIT – I (9 + 3)

Laplace Transforms: Integral transforms, Kernel of a transform, Laplace transform of a function, Inverse Transform-Existenceanduniquenessof LaplaceTransforms,S-planeandregionofconvergence(ROC), LaplaceTransformofsomecommonlyusedsignals-Dirac-delta(impulse)function$[\delta(t)]$,step$[u(t)]$,ramp $[tu(t)]$,parabolic$[t^2u(t)]$,realexponential$[e^{at}u(t)]$,complexexponential$[e^{j\Omega t}u(t)]$,sineandcosinefunctions , damped sine and cosine functions, hyperbolic sine and cosine functions, damped hyperbolic sine and cosine functions, rectangular pulse and triangle. Properties of Laplace Transforms- linearity, first shifting theorem (frequency shift property), Laplace transforms of derivatives and integrals, time scaling property, time reversal property, Laplace transform of Heaviside unit step function, second shifting theorem (time shift property), initial value and final value theorems, Laplace transform of periodic functions-convolution theorem.

Operational Calculus: Solution of ordinary differential equations with constant coefficients and system of ordinary differential equations with constant coefficients using Laplace transforms. Application of Laplace transforms to the first order and second order system subjected to impulse, step, periodic, rectangular, square, ramp, triangular and sinusoidal functions

UNIT-II (9+3)

Fourier Series: Periodic functions, orthogonal and orthonormal functions, Euler formulae, representation of a function as Trigonometric Fourier series (FS) in a range of length 2π, conditions for the existence of Fourier series (Dirichlet's conditions), FS for typical wave forms-square wave, pulse train, impulse train(comb function), periodic rectangular wave, triangle, saw tooth, half wave rectified signal, full wave rectified signal, plotting FS coefficients - line spectrum (magnitude and Phase spectra), Fourier series on an arbitrary period, effects of symmetry of function on FS coefficients, half range series – half range cosine and sine series expansions, exponential FS

UNIT-III (9+3)

Complex Variables: Functions of complex variables, limit, continuity, differentiability, analytic functions, Cauchy-Riemann Equations in cartesian and polar coordinates. elementary functions, harmonic functions,

construction of analytic functions, applications to find velocity potential and stream function of a flow, conformal mapping and bilineartransformation

UNIT-IV (9+3)

Complex Integration: Line integration in complex plane, integral of a non-analytic function, dependence on path of integration, *ML*-inequality, Cauchy's integral theorem, Cauchy's integral formula, series expansion of complex functions: Taylor's series and Laurent's series, zeros and singularities, residues, Residue theorem- applications of residue theorem to the properly chosen integrals around a unit circle and semi-circle.

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Textbook:

[1] Grewal, B.S., *Higher Engineering Mathematics*, 44th ed., New Delhi: Khanna Publishers, 2017. *(Chapters 21,10,20)*

Reference Books:

[1] Kreyszig E., *Advanced Engineering Mathematics*, 9th ed., New Jersey: John Wiley & Sons, 2013.
[2] Churchill R.V., *Complex Variable and its Applications*, 9th ed., New York: McGraw Hill, 2013.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.
Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.
Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: apply Laplace transform to solve certain differential equations whose solutions cannot be computed using classical methods
CO2: describe a given function as Fourier series in an interval
CO3: construct analytic function, find velocity potential and stream function of a fluid flow using complex analytical methods
CO4: represent a given function in Taylor's & Laurent's series and evaluate certain real integrals using integral theorems

Course Articulation Matrix: U18MH301 ENGINEERING MATHEMATICS-III

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18MH301.1	2	2	-	-	-	-	-	-	-	-	-	1	2	1
CO2	U18MH301.2	2	2	-	-	-	-	-	-	-	-	-	1	2	1
CO3	U18MH301.3	2	2	-	-	-	-	-	-	-	-	-	1	2	1
CO4	U18MH301.4	2	1	-	-	-	-	-	-	-	-	-	1	2	1
U18MH301		**2**	**1.75**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**

U18TP302 SOFT AND INTERPERSONALSKILLS

Class: B. Tech.III-Semester
B. Tech. IV-Semester

Branch: ME, CSE, IT
CSE, EIE, EEE, ECE

Teaching Scheme:

L	T	P	C
-	–	2	1

Examination Scheme:

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on….

LO1 : analyzing self and learning to overcome possible threats
LO2 : group dynamics to demonstrate respect for the opinions and beliefs of group
LO3 : effective presentations using visual aids and analyzing the videos
LO4 : communicating professionally, making resume in line with industry expectations

LIST OF ACTIVITIES

Introduction

Activity 1	Team interaction
Activity 2	SWOT analysis
Activity 3	Debate
Activity 4	Group Discussion

Activity 5	Presentations through PPTs
Activity 6	Video Synthesis
Activity 7	Resume Writing
Activity 8	Email Etiquette

Activity9 : My interview Plan: Self Introduction &FAQs
Activity10 : My Career Plan Oralpresentation
} Comprehensive Presentation

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Text Books:

1. Krishna Mohan & Meera Benerji, *Developing Communications Skills*, New Delhi: Mcmillan Publications, 2005.
2. Alex. K, *Soft Skills*, New Delhi: S. Chand Publications,2010.
3. Raman & Meenakshi, *Soft skills Cornerstone of Professional success*, New Delhi: Jain Brothers Publications, 2009.

References:

1. *https://onlinecourses.nptel.ac.in/noc19_hs20/preview*
2. *https://onlinecourses.nptel.ac.in/noc18_hs30/preview*

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: introspect to convert strengths into opportunities, identify weaknesses, bypass threats

CO2: present views on various issues confidently in a group

CO3: make effective PPT presentations, synthesize videos

CO4: prepare a professional resume, communicate effectively to attain better opportunities

Course Articulation Matrix: U18TP302 SOFT AND INTERPERSONALSKILLS														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18TP302.1	-	-	-	-	-	-	-	-	2	3	-	-	-	-
CO2	U18TP302.2	-	-	-	-	-	-	-	2	3	3	-	-	-	-
CO3	U18TP302.3	-	-	-	-	-	-	-	-	2	3	-	-	-	-
CO4	U18TP302.4	-	-	-	-	-	-	-	1	2	3	-	-	-	-
U18TP302		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.5**	**2.25**	**3**	**-**	**-**	**-**	**-**

U18EE303 NETWORK THEORY

Class: B. Tech.III-Semester **Branch:** Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	1	–	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on….

LO1 : steady state analysis of electrical networks, resonance and network topology

LO2 : network theorems and their application for network analysis

LO3 : time response analysis of networks

LO4 : two port networks and their equivalent circuit representation

UNIT – I (9+3)

Circuit Elements and Relations: Introduction, Kirchhoff's laws, types of sources and source transformations, network reduction by star–delta transformation

Steady State Analysis of Circuits for Sinusoidal Excitations: Analysis of single-phase series, parallel and series-parallel circuits, resonance - series and parallel resonance, bandwidth, q-factor, mesh and nodal analysis; 3-phase network analysis - balanced and unbalanced networks

Network Topology: Topological description of networks - lumped Vs distributed circuits, network graph theory - tree, co-tree and loops, incidence matrix, fundamental tie-set and cut-set matrices

UNIT – II (9+3)

Network theorems and applications: Introduction, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, reciprocity theorem, Millman's theorem, Tellegen's theorem, compensation theorem and substitutiontheorem

UNIT – III (9+3)

Time response analysis of networks: Transient analysis of RL, RC, RLC series and parallel networks with step, impulse, sinusoidal and pulse excitation, initial conditions, analysis with special signal waveforms - ramp, triangular, train of pulses, delayed input

UNIT – IV (9+3)

Two port networks : Characterizations of linear time invariant two port networks - open circuit impedance parameters, short circuit admittance parameters, transmission parameters, inverse-transmission parameters, hybrid parameters, inverse-hybrid parameters, symmetry and reciprocity conditions in terms of two-port parameters, inter-relationship between parameters, inter connections of two-port networks, ladder network, bridged-T, parallel-T and lattice-T networks, terminated two-port networks

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Textbooks:

[1] D. Roy Choudhary, *Networks and Systems*, 2nd ed., New Delhi: New Age International Pvt. Ltd.,2010.

[2] W.H. Hayt and Jr. Kemmerly, *Engineering Circuit Analysis*, 7th ed., New Delhi: McGraw-Hill Higher Education, 2006.

Reference Books:

[1] M.E. Van Valken Burg, *Network Analysis*,3rd ed., New Delhi: Pearson Education,2006.

[2] K. A. Gangadhar, *Circuit Theory*, 2nd ed., New Delhi: Khanna Publishers, 2006.

[3] Parker Smith, *Problems in Electrical Engineering*, New Delhi: CBS Publishers, 2010.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: determine voltage, current, power by performing steady state analysis, calculate bandwidth, Q-factor of resonant circuits and construct incidence, tie-set, cut-set matrices using network topology

CO2: apply suitable network theorems to applications in electrical engineering

CO3: evaluate transient & steady state response of RLC circuits with step, sinusoidal & other special signals

CO4: find two port network parameters and draw equivalent circuit of given two-port network

Course Articulation Matrix: U18EE303 NETWORKTHEORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE303.1	2	2	1	1	1	-	-	-	1	1	-	1	2	1
CO2	U18EE303.2	2	2	2	1	1	-	-	-	1	1	1	1	2	1
CO3	U18EE303.3	2	2	1	1	1	-	-	-	1	1	1	1	2	1
CO4	U18EE303.4	2	2	1	1	1	-	-	-	1	1	-	1	2	1
U18EE303		**2**	**2**	**1.25**	**1**	**1**	-	-	-	**1**	**1**	**1**	**1**	**2**	**1**

U18EE304 ELECTRICAL MEASUREMENTS &INSTRUMENTATION

Class: B. Tech.III-Semester **Branch:** Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on….

LO1 : significance and errors of measuring instruments, performance of various instruments to measure voltage and current

LO2 : performance of various instruments for measuring power, energy, power factor and unknown resistance, inductance & capacitance measurement using bridges

LO3 : construction, performance and errors in CTs, PTs and their use for measuring high range current and voltage; applications of DC and AC Potentiometers for measurement and calibration of electrical quantities

LO4 : construction, operation and applications of electronic instruments (CRO, DVM and DSO) and transducers (Strain gauge, LVDT, Thermocouple)

UNIT –I (9)

Introduction and Error Analysis: Significance of measurement, static characteristics of measuring system-linearity, sensitivity, precision, accuracy, errors in measuring instruments

Voltage and Current Measuring Instruments: Construction, operation, torque equation, sensitivity, errors, advantages and disadvantages of Permanent Magnet Moving Coil (PMMC) instrument, Moving Iron (MI) instruments and electrodynamometer type instruments, extension of ranges of voltmeters and ammeter, loading effect on measuring instruments

UNIT – II (9)

Measurement of Power, Energy and Power factor: Construction, operation, torque equation, errors, advantages and disadvantages of dynamo meter type wattmeter, induction type energy meter, measurement of three phase active and reactive power, phantom loading, introduction to static energy meter and smart energy meter

DC Bridges: Measurement of unknown resistance using Wheatstone bridge, Kelvin's double bridge, Megohm bridge and megger

AC Bridges: Measurement of unknown inductance using Maxwell's bridge, Anderson's bridge, Hay's bridge, Owen's bridge, measurement of unknown capacitance using De Sauty's bridge, Schering bridge and Wien's bridge

UNIT –III (9)

Instrument Transformers: Introduction, uses, ratios and burden, current transformers-construction and errors, effect of secondary open circuit, potential transformers- construction and errors, testing of current transformers with Silsbee's method, Introduction to Hall effect current sensor

Potentiometers: Construction, standardization and applications of DC potentiometers, construction and operation of phase shifting transformer and phase shifting circuit, construction, standardization and operation of polar and co-ordinate type AC potentiometers, applications of AC potentiometers

UNIT-IV (9)

Electronic Instruments: Construction and operation of Cathode Ray Oscilloscope (CRO), electrostatic deflection system, horizontal and vertical amplifiers, screens and probes used in CRO, deflection sensitivity and deflection factor, measurement of unknown frequency and phase using Lissajous patterns, construction and operation of Digital Voltmeters (DVM), block diagram representation of Digital Storage Oscilloscope (DSO)

Transducers: Introduction and classification of transducers, theory of Strain gauges, thermocouples, Linear Variable Differential Transformer (LVDT)

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Textbook:

[1] A.K. Sawhney, *A course in Electrical and Electronic Measurement and Instrumentation*, 19th ed., New Delhi: Dhanpat Rai & Co. Publications, 2011.

Reference Books:

[1] J. B. Gupta, *A course in Electrical and Electronic Measurements and Instrumentation*, 13th ed., New Delhi: Kataria and Sons, 2009.

[2] U. A. Bakshi, A. V. Bakshi, *Electrical Measurements and Instrumentation*, Pune: Technical Publications, 2009.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: compare the performance of conventional and modern instruments and select suitable instrument based on their application to measure voltage, current, power, power factor & energy

CO2: determine the unknown circuit parameters (R,L,C) using DC & AC bridges

CO3: describe the operation of CTs, PTs, compute the errors & their applications for measuring high range current and voltage and apply the DC &AC potentiometers for measurement of electrical quantities & calibration of electrical equipment

CO4: measure electrical & non-electrical quantities using CRO, DVM, DSO and describe the transducers employed for measurement of strain, temperature & displacement

Course Articulation Matrix: U18EE304 ELECTRICAL MEASUREMENTS &INSTRUMENTATION

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE304.1	3	2	1	-	-	-	-	-	-	-	-	-	1	-
CO2	U18EE304.2	3	2	1	-	-	-	-	-	-	-	-	-	2	1

CO3	U18EE304.3	3	2	2	-	-	-	-	-	-	-	-	-	1	1
CO4	U18EE304.4	3	2	2	-	-	-	-	-	-	-	-	-	2	1
U18EE304		**3**	**2**	**1.5**	-	-	-	-	-	-	-	-	-	**1.5**	**1**

U18EE305 ELECTROMAGNETICFIELDS

Class: B. Tech.III-Semester **Branch:** Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on….

LO1 : concepts of electric forces and fields for different configurations

LO2 : fields in different materials and capacitance calculations

LO3 : effect of magnetic field in electrical systems, magnetic potentials and inductance

LO4 : Maxwell's equations, wave equation

UNIT –I(9)

Introduction: Cartesian, Cylindrical and Spherical Co-ordinate Systems, Field theory Vs Circuit theory

Static Electric Fields: Coulomb's law, electric field intensity, field due to different charge configurations, electric flux, electric flux density, Gauss' law and its applications, Divergence theorem, relation between D and E, work done in moving a unit positive charge, electric potential, absolute potential, potential difference between two points and its independence in path of integration, potentials caused by different types of charge configurations, relation between E and V, electro static energy, energydensity

UNIT –II (9)

Dipoles: Potential and electric field at a point due to electric dipole, torque on electric dipole when placed in electric field

Electric field in materials: Conductors in electrostatic fields, polarization in dielectrics, dielectric strength& constant, boundary conditions between dielectrics, Laplace's and Poisson's equations **Capacitance:** Capacitance of Parallel plate, cylindrical and spherical capacitors, conduction and convection currents, currentdensity

UNIT –III (9)

Static Magnetic fields : Concept of magnetic field, Biot- Savart's law, Ampere's law and its applications, magnetic flux and flux density, magnetic field caused by different types of current configurations, scalar and vector magnetic potentials, calculation of vector magnetic potentials for simple cases, vector Poisson'sequation

Magnetic Forces: Force on a moving charge, force on a differential current element, force between differential current elements. magnetic boundary conditions, magnetic dipole, magnetization in material

UNIT –IV (9)

Inductance: Self-inductance, mutual-inductance, calculation of inductance of solenoid

Maxwell's equations: Maxwell's equations for static fields, Faraday's law, displacement current, Maxwell's equations for time varying fields, wave equation

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Textbook:

[1] K. A. Gangadhar, *Field Theory*, 8th ed., New Delhi: Khanna Publishers, 2015.

References Books:

[1] W. H Hayt (Jr.), *Engineering Electromagnetics*, 8th ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2014.

[2] Mathew. N. O. Sadiku, *Principles of Electromagnetics*, 6th ed., New Delhi: Oxford University press, 2015.

[3] David J. Griffiths, *Introduction to Electrodynamics*, 4th ed., New Delhi: Pearson Ind. Pvt. Ltd., 2013.

[4] Edward.C.Jordan&Keith.G.Balmain, *Electromagneticwavesandradiatingsystems*, 2nd ed., New Delhi: Prentice Hall of India, 1990.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: compute the electrostatic fields for different configurations by using suitable coordinate systems

CO2: analyse the polarization in dielectric materials and determine the capacitance for different charge configurations

CO3: compute the static magnetic fields for different current configurations and analyze the magnetization in various types of magnetic materials

CO4: determine the inductance for different current configurations and explain Maxwell's equations related to time-varying fields

Course Articulation Matrix: U18EE305 ELECTROMAGNETICFIELDS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE305.1	3	2	1	-	-	-	-	-	-	-	-	-	3	1
CO2	U18EE305.2	3	2	2	-	-	-	-	-	-	-	-	-	3	1
CO3	U18EE305.3	3	2	2	-	-	-	-	-	-	-	-	-	3	1
CO4	U18EE305.4	3	2	1	-	-	-	-	-	-	-	-	-	3	1
U18EE305		**3**	**2**	**1.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**1**

U18EC310 ELECTRONIC DEVICES AND CIRCUITS

Class: B. Tech.III-Semester **Branch:** Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on….

LO1 : conduction in semiconductors and semiconductor diode characteristics

LO2 : half wave –full wave rectifiers with and without filters

LO3 : transistors characteristics, biasing and thermal stabilization

LO4 : FET characteristics, FET biasing and characteristics of special devices SCR, UJT, DIAC, TRIAC& LED

UNIT-I (9)

Conduction in Semiconductors: Conductivity of a semiconductor, carrier concentrations in an intrinsic semiconductor, donor and acceptor impurities, charge densities in a semiconductor, fermi level in a semiconductor having impurities, diffusion, carrier life time, continuity equation, the Hall effect

Semiconductor Diode Characteristics: Qualitative theory of P-N junction, P-N Junction as a diode, band structure of an open circuited p-n junction, quantitative theory of P-N diode currents, the volt- ampere characteristics, the temperature dependence of P-N Characteristics, diode resistance, space charge or transition capacitance, diffusion capacitance, breakdown diodes, the tunnel diode, characteristics of a tunnel diode

UNIT-II (9)

Rectifiers: A half wave rectifier, ripple factor, a full wave rectifier, harmonic components in rectifier circuits, inductor filters, capacitor filters, approximate analysis of capacitor filters, L - section filter, multiple L - section filter, π - section filter

UNIT-III (9)

Transistor Characteristics: The junction transistor, transistor current components, the transistor as an amplifier, the common base configuration, the common emitter configuration, the common collector configuration

Transistor Biasing & Thermal Stabilization: The operating point, transistor as a switch, bias stability, collector to base bias, self-bias, stabilisation against variations in VBE and β for the self bias circuit, bias compensation, thermistor & sensistor compensation, thermal runaway and thermal stability, photo transistor

UNIT-IV (9)

Field Effect Transistors: Construction and characteristics of JFETs, transfer characteristics, depletion-type MOSFET and enhancement-type MOSFET

FET Biasing: Fixed bias configuration, self-bias configuration, voltage divider biasing, common gate

configuration, common drain configuration, depletion-type MOSFETs, enhancement- type MOSFETs

Special Devices: Silicon Controlled Rectifier, Basic Silicon Controlled Rectifier operation, SCR characteristics & ratings, Silicon Controlled Switch, DIAC, TRIAC, Uni-Junction Transistor, LED, photo Diode, Photo Transistor, LASER and LCD

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Textbooks:

[1] Jacob Millman, Christos C Halkias & Satyabrata JIT, *Electronic Devices and Circuits*, New Delhi: Tata McGraw Hill Education (INDIA) Private Ltd,2007.

[2] Robert L Boylested and Louis Nashelsky, *Electronic Devices and Circuit Theory*, 10th ed., New Delhi: Pearson Ind. Pvt. Ltd., 2009.

Reference Books:

[1] Adel S. Sedra and Kenneth C. Smith, *Microelectronic Circuits*, 6th ed., New Delhi: Oxford University Press.

[2] Donald Neaman, *Electronic Circuits: Analysis and Design*, 3rd ed.,New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2006.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: analyze conduction in semiconductors and estimate the diode parameters from its characteristics

CO2: examine the performance characteristics of rectifiers with and without filters

CO3: design the biasing circuits, compare the various configurations of BJT

CO4: design of FET biasing circuits, study the characteristics of special devices

Course Articulation Matrix: U18EC310 ELECTRONIC DEVICES ANDCIRCUITS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC310.1	3	2	2	-	-	-	-	-	-	-	2	1	-	-
CO2	U18EC310.2	2	3	3	-	-	-	-	-	1	-	2	1	2	1
CO3	U18EC310.3	2	2	3	-	-	-	-	-	1	-	2	1	2	1
CO4	U18EC310.4	2	3	3	-	-	-	-	-	1	-	2	1	2	1
U18EC310		**2.25**	**2.5**	**2.75**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**1**	**2**	**1**

U18EE307 ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LABORATORY

Class: B. Tech.III-Semester **Branch:** Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in/on….

LO1 : calibration of single-phase energy meter, LPF wattmeter & voltmeter

LO2 : measurement of resistance, inductance & capacitance using AC and DC bridges and measurement of three phase active power and reactive power

LO3 : measurement of ratio error for CTs and PTs

LO4 : measurement of frequency and phase angle using CRO; displacement, strain and temperature measurement using LVDT, strain gauge and thermocouple

LIST OF EXPERIMENTS

1. Measurement of energy using conventional energy meter and static energymeter
2. Calibration of LPF wattmeter by phantomloading
3. Measurement of three phase active power by using two wattmetermethod
4. Measurements of three phase reactive power using single wattmetermethod
5. Measurement of unknown resistance using Wheatstonebridge
6. Measurement of inductance using Maxwell's inductance-capacitancebridge
7. Calibration of PMMC voltmeter using DCpotentiometer
8. Determination of ratio error of current transformer and potentialtransformer
9. Measurement of phase angle and frequency using Lissajous patterns ofCRO
10. Displacement measurement using Linear Variable Differential Transformer(LVDT)
11. Measurement of strain using straingauge
12. Study of characteristics of J-typethermocouple
13. Calibration of conventional single-phase energy meter with phantomloading

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Laboratory Manual:

[1] *Electrical Measurements & Instrumentation Laboratory Manual*, Department of EEE, KITSW.

Reference Book:

[1] A.K. Sawhney, A course in Electrical and Electronic Measurement and Instrumentation, 19th ed., New Delhi: Dhanpat Rai & Co. Publications, 2011.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: calibrate single phase energy meter, LPF wattmeter using direct & phantom loading and calibration of voltmeter using DC potentiometer

CO2: measure unknown resistance, inductance & capacitance using AC & DC bridges, three phase active power & reactive power using two wattmeter & single wattmeter method

CO3: determine the ratio error in CTs and PTs.

CO4: apply LVDT, strain gauge, thermocouple for the measurement of non-electrical quantities and CRO for the measurement of frequency & phase angle using Lissajous patterns

Course Articulation Matrix: U18EE307 ELECTRICAL MEASUREMENTS& INSTRUMENTATION LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE307.1	3	2	2	1	1	-	-	1	3	2	-	-	1	1
CO2	U18EE307.2	3	2	1	1	-	-	-	1	3	2	-	-	1	1
CO3	U18EE307.3	2	2	2	1	-	-	-	1	3	2	-	-	1	1
CO4	U18EE307.4	2	2	2	1	-	-	-	1	3	2	-	-	1	1
U18EE307		**2.5**	**2**	**1.75**	**1**	**1**	**--**	**-**	**-**	**3**	**2**	**--**	**-**	**1.25**	**1**

U18EE308 NETWORKS & SIMULATIONLABORATORY

Class: B. Tech.III-Semester **Branch:** Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in/on….

LO1 : network theorems

LO2 : two port network parameters

LO3 : mesh and nodal analysis of electrical networks using MATLAB

LO4 : transient analysis of series circuits using MATLAB

LIST OF EXPERIMENTS

1. Verification of superposition theorem
2. Verification of Thevenin's theorem
3. Verification of maximum power transfer theorem
4. Verification of reciprocity theorem
5. Frequency response of series RLC circuit
6. Determination of Z-parameters of two-port network
7. Determination of Y-parameters of two-port network
8. Determination of ABCD parameters & inverse ABCD parameters of two-port network
9. Determination of hybrid parameters & inverse hybrid parameters of two-port network
10. Use of mesh analysis to find the current flowing through the element using MATLAB software for the given circuit
11. Determination of nodal voltages of the given circuit using MATLAB software
12. Time response analysis of network using MATLAB software

******

Laboratory Manual:

[1] *Networks & Simulation Laboratory Manual*, Department of EEE, KITSW.

Reference Books:

[1] Bhanu Bhaskara , Siddhartha Bhaskara, *Basic Simulation Lab with MATLAB,* New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2011.

[2] William J. Palm III, *Introduction to MATLAB*, 2nd ed., New Delhi: McGraw Hill Education (India) Pvt. Ltd.,2010

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: conduct experiment to validate network theorems

CO2: determine network parameters for a given two port network

CO3: simulate electrical circuit to perform mesh and nodal analysis using MATLAB

CO4: simulate and evaluate the time response of AC series circuits using MATLAB

Course Articulation Matrix: U18EE308 NETWORKS & SIMULATIONLABORATORY														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18EE308.1	3	3	2	1	-	-	-	1	3	2	2	1	2	1
CO2	U18EE308.2	3	3	2	1	-	-	-	1	3	2	2	1	2	1
CO3	U18EE308.3	3	3	3	1	2	-	-	1	3	2	2	2	2	1
CO4	U18EE308.4	3	3	3	1	2	-	-	1	3	2	2	2	2	1
U18EE308		**3**	**3**	**2.5**	**1**	**2**	**-**	**-**	**1**	**3**	**2**	**2**	**1.5**	**2**	**1**

U18EC311 ELECTRONIC DEVICES AND CIRCUITSLABORATORY

Class: B. Tech.III-Semester **Branch:** Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in/on….

LO1 : characteristics of diodes, rectifiers, BJT & FET

LO2 : single stage amplifiers design & analysis

LO3 : feedback amplifiers & oscillator circuits analysis

LO4 : tuned voltage amplifiers & power amplifiers

LIST OF EXPERIMENTS

1. Characteristics of a semiconductor diode & Zener diode
2. Half-wave / full – wave rectifier with and without filters
3. BJT characteristics – CE configuration
4. Biasing of transistor using fixed bias, self-bias
5. FET characteristics CS (Common Source)
6. Design of single stage BJT amplifiers and its frequency response
7. Design of FET CS Amp and its frequency response
8. Design of voltage series feedback amp
9. Design of RC Phase Shift Oscillator
10. Design of LC Oscillator
11. Design of class B power amplifier
12. Design of Single tuned amplifier

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Laboratory Manual:

[1] *Electronic Devices and Circuits Laboratory Manual*, Department of ECE, KITSW

Reference Book:

[1] Jacob Millman and C.C. Halkias, *Integrated Electronics*, 2nd ed., New Delhi: Tata McGraw Hill Education (INDIA) Private Ltd,1991.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: examine the characteristics of diode, BJT & FET and determine rectifier circuit parameters

CO2: design single stage & multi stage amplifiers and analyze circuits for the given specifications

CO3: evaluate the parameters of feedback amplifiers and design RC & LC oscillators circuits for a specified frequency

CO4: determine the performance parameters of tuned & power amplifiers

Course Articulation Matrix: U18EC311 ELECTRONIC DEVICES & CIRCUITSLABORATORY														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18EC311.1	3	2	2	3	3	-	1	-	3	2	2	-	-	-
CO2	U18EC311.2	3	2	2	3	3	-	1	-	3	2	2	-	2	1
CO3	U18EC311.3	3	2	2	3	3	-	1	-	3	2	2	-	2	1
CO4	U18EC311.4	3	2	2	3	3	-	1	-	3	2	2	-	2	1
U18EC311		**3**	**2**	**2**	**3**	**3**	**-**	**1**	**-**	**3**	**2**	**2**	**-**	**2**	**1**

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15
(An Autonomous Institute under Kakatiya University, Warangal)
SCHEME OF INSTRUCTIONS & EVALUATION
IV-SEMESTER OF 4-YEAR B.TECH. DEGREE PROGRAMME

(6Th+3P+2MC)

Sl.No	Course Category	Course Code	Course Name	Periods/week			Credits	Evaluation Scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	MC	U18MH415	Essence of Indian Traditional Knowledge	2	-	-	-	10	30	40	60	100
2	OE	U18OE401	Open Elective -II	3	1	-	4	10	30	40	60	100
3	HSMC	U18MH402	Professional English	-	-	2	1	10	30	40	60	100
4	OE	U18OE403	Open Elective -I	3	-	-	3	10	30	40	60	100
5	PCC	U18EE404	Power Systems-I	3	-	-	3	10	30	40	60	100
6	PCC	U18EE405	Electrical Machines-I	3	1	-	4	10	30	40	60	100
7	PCC	U18EC412	Analog and Digital Electronics	3	-	-	3	10	30	40	60	100
8	PCC	U18EE407	Electrical Machines Laboratory -I	-	-	2	1	40	-	40	60	100
9	PCC	U18EC413	Analog and Digital Electronics Laboratory	-	-	2	1	40	-	40	60	100
10	OE	U18OE411	OE-I based lab	-	-	2	1	40	-	40	60	100
11	MC	U18CH409	Environmental Studies*	2	-	-	-	10	30	40	60	100
			Total	**17/19***	**2**	**8**	**21**	**190/200***	**210/240***	**400/440***	**600/660***	**1000/1100***

Note: L - Lectures; T – Tutorials; P – Practicals; CIE – Continuous Internal Evaluation; TA – Teachers Assessment; MSE – Mid Semester Examination; ESE – End Semester Examination;

*** indicates mandatory non-credit course for Lateral Entry Students only**

Student Contact Hours/Week : 27/29*
Total Credits(C) : 21

Open Elective-I
U18OE403A: Object Oriented Programming (CSE)
U18OE403B: Fluid Mechanics & Hydraulic Machines (CE)
U18OE403C: Mechatronics (ME)
U18OE403D: Web Programming (IT)
U18OE403F: Strength of Materials (ME)

Open Elective-II
U18OE401A: Applicable Mathematics (MH)
U18OE401C: Elements of Mechanical Engineering (ME)
U18OE401E: Fundamentals of Computer Networks (IT)

Open Elective-I based Laboratory
U18OE411A: Object Oriented Programming Laboratory (CSE)
U18OE411B: Fluid Mechanics & Hydraulic Machines Laboratory (CE)
U18OE411C: Mechatronics Laboratory (ME)
U18OE411D: Web Programming Laboratory (IT)
U18OE411F: Strength of Materials Laboratory (ME)

U18MH415 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Class: B. Tech.IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
2	-	–	-

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : basic structure of Indian knowledge system

LO2 : Indian perspective of modern science

LO3 : basic principles of yoga and holistic health care

LO4 : benefits of yoga practice

Unit – I(6)

Basic Structure of Indian Knowledge System: Introduction, Vedas – origin, classification, structure, Rig Veda, Sama Veda, Yajur Veda, Atharva Veda, UpaVedas – DhanurVeda, SthapatVeda, GandharvaVeda, AyurVeda, Vedang – Shiksha, Chanda, Vyakarna, Nirukta, Kalpa, Jyothisha, Upanga – Dharmashastra, Mimamsa, Tarkashastra, Purana

Unit – II (6)

Modern Science and Indian Knowledge System: Introduction, Vedas as basis for modern science, architectural developments, medicine and its relevance, mathematical sciences in Vedas, space and military related developments, chemical sciences

Unit – III (6)

Yoga and Holistic Health Care: Healthy mind in healthy body , yoga: definition, types, yoga to keep fit: diet, yoga asanas, fundamentals, breathing techniques in Patanjali yoga tradition , pranayama, chakras, meditation, benefits of yoga – physical health, emotional health, prevention of disease, reducing or alleviating symptoms ofproblems

Unit – IV (6)

Case studies – Yoga Practice: Yoga as an effective tool for management of human crisis – depression, self – concept & mental health, yoga for stress management, yoga: a way to cure for insomnia

Requisite: Yoga practice sessions are to be conducted for all the students taking this course by the time they complete Unit 1 and Unit2

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Textbooks:

[1] Sathish Chandra Chaterjee, Dhirendramohan Datta, *An Introduction to Indian Philosophy*, New Delhi: Rupa Publications Pvt. Ltd. (Chapter 2,3)

[2] Priyadaranjan Ray, S.N. Sen, *The Cultural Heritage of India, Vol. 6, Science and Technology*, Kolkata: The Ramakrishna Mission Institute of Culture

[3] *Yoga Sutra of Patanjali*, Kolkata: Ramakrishna Mission.

[4] RN Jha, *Science of Consciousness Psychotherapy and Yoga Practices*, New Delhi: Vidyanidhi Prakasham, 2016 (Chapter 4, 5, 6, 7,8)

Reference Book:

[1] Swami Jitatmananda, *Holistic Science and Vedanta*, Mumbai: Bharatiya Vidya Bhavan (Chapter 2, 3)

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: summarize the basic structure of Vedas, Upavedas, Vedanga, Upanga

CO2: explain Vedas as principal source of knowledge for scientific inventions

CO3: describe different yogasanas, breathing techniques, chakras, meditation and their benefits

CO4: discuss the benefits of yoga as an effective tool for management of human crisis

Course Articulation Matrix: U18MH415 ESSENCE OFINDIAN TRADITIONAL KNOWLEDGE

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18MH415.1	-	-	-	-	-	1	-	2	1	1	-	-	-	-
CO2	U18MH415.2	-	-	-	-	-	1	1	2	1	1	-	-	-	-
CO3	U18MH415.3	-	-	-	-	-	1	-	2	2	1	-	2	-	-
CO4	U18MH415.4	-	-	-	-	-	1	1	2	2	1	-	2	-	-
U18MH415		**-**	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**1.5**	**1**	**-**	**2**	**-**	**-**

U18OE401A APPLICABLEMATHEMATICS

Class: B. Tech.IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	1	–	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : application of Fourier series to solve wave equation, heat conduction equation and Laplace equation

LO2 : the methods of fitting curves by the method of least squares, statistical methods and probability distributions with applications to engineering disciplines

LO3 : finite difference operators, the concept of interpolation and numerical integration

LO4 : numerical methods and application to find numerical solutions of differential equations

UNIT-I (9+3)

Applications of Partial Differential Equations: Basic concepts of partial differential equations, classification of second order partial differential equations, solution of a partial differential equation, solution through the method of separation of variables

Vibrating String: Wave equation and its solution by the method of separation of variables, D'Alembert's solution of wave equation, solutions of various boundary value problems based on vibrating string

One Dimensional Heat Flow: Transient heat flow equation, heat flow through a bar of finite length with homogeneous and non-homogeneous boundary conditions, heat flow through a bar with insulated ends

Two Dimensional Heat Flow: Equation of two dimensional heat flow (Laplace's equation) under steady state / the electrostatic potential of electrical charges in any region that is free of these charges (problems based on Trigonometric FS only),solution of Laplace's equation in cartesian and polar form, heat flow through infinite rectangular plates, finite square plate and semicircular and circular plates

UNIT-II (9+3)

Statistics: Statistical data: Review of measures of central tendency and measures of dispersion, correlation coefficient, rank correlation, regression – Linear regression equations

Curve Fitting: Method of least squares –fitting of (i) Straight line (ii) Second degree parabola, Exponential curves, most plausible solution of a system of linear algebraic equations

Probability: Review of the concepts of probability, random variables, Discrete and continuous probability distributions, mean and variance of a distribution, Binomial distribution, Poisson distribution, and Normal distribution, fitting of these probability distributions to the given data

UNIT-III (9+3)

Numerical Analysis: Finite differences and difference operators

Interpolation: Newton's forward and backward interpolation formulae. Lagrange interpolation

Numerical Differentiation: First and second derivatives using forward and backward interpolation polynomials at the tabulated points

Numerical Integration: Gaussian quadrature formula, Trapezoidal rule, Simpson's $1/3^{rd}$ rule and Simpson's $3/8^{th}$ rule

UNIT-IV (9+3)

Solution to System of Linear Equations: Gaussian elimination method, Jacobi Method and Guass-Siedel iteration method

Numerical Solution of Algebraic and Transcendental Equations: Bisection method, Regula-Falsi method and Newton Raphson's method

Numerical Solution of Ordinary Differential Equations: Taylor's method, Picard's method, Euler's method and Runge - Kutta methods of second and fourth order

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Textbook:

[1] Grewal, B.S., *Higher Engineering Mathematics*, 43rd ed., New Delhi: Khanna Publishers, 2014.

Reference Books:

[1] Gupta and Kapoor, *Fundamentals of Mathematical Statistics*, 11th ed., New Delhi: S. Chand & Company Ltd., 2010.

[2] Kreyszig E., *Advanced Engineering Mathematics*, 9th ed., New Jersey: John Wiley & Sons , 2013.

[3] Sastry S.S, *Introduction to Numerical Analysis*, 4th ed., New Delhi: PHI Learning Pvt. Ltd.,2005.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: solve wave equation, heat conduction equation and Laplace equation using Fourier series

CO2: find correlation regression coefficients, fit curves using method of least squares for given data and apply theoretical probability distributions in decision making

CO3: estimate value of a function by applying interpolation formulae

CO4: apply numerical methods to solve simultaneous algebraic equations, differential equations, find roots of algebraic and transcendental equations

Course Articulation Matrix: U18OE401A APPLICABLEMATHEMATICS														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18OE401A.1	2	2	--	--	--	--	--	--	--	--	--	1	2	1
CO2	U18OE401A.2	2	2	--	--	--	--	--	--	--	--	--	1	2	1
CO3	U18OE401A.3	2	2	--	--	--	--	--	--	--	--	--	1	2	1
CO4	U18OE401A.4	2	2	--	--	--	--	--	--	--	--	--	1	2	1
U18OE401A		**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**1**

U18OE401C ELEMENTS OF MECHANICALENGINEERING

Class: B. Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	1	–	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : types of materials, design methodology and elements of power transmission

LO2 : different manufacturing processes and their applications

LO3 : laws of thermodynamics and types of systems

LO4 : principle and applications of SI &CI engines

UNIT- I (12)

Engineering Materials: Classification, properties and applications

Design Criterion: Discrete steps in engineering design process

Power Transmission: Classification, flat belt drives - length of open and cross belts, belt tensions and power transmitted, Gears-types and applications, spurgear-nomenclature

Bearings: Types – sliding& rolling contact bearings and applications.

UNIT- II (12)

Manufacturing Processes: Classification, Foundry- steps in sand casting process, pattern-types, materials and allowances, mould cross section, moulding sand-composition and properties, Machining: lathe machine-line diagram and operations, Welding-classification, principle of arc welding- AC and DC welding, principle of gas welding, principle of brazing and soldering, Metal forming process: forging, rolling, extrusion

UNIT- III (12)

Thermodynamics: System-types, state, property, process and cycle, Energy-property, Zeroth law, thermodynamic equilibrium, laws of perfect gases

Law of Thermodynamics: First law- applied to a cycle, change of state, internal energy, enthalpy, work and heat in closed systems- isobaric, isochoric, isothermal, adiabatic and polytropic, PMM-I, limitations of first law of thermodynamics

UNIT- IV (12)

Second Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their equivalence, Carnot cycle, Carnot theorem, heat engine, heat pump and refrigerator, working principle of domestic air conditioner-line diagram

IC Engines: Classification, working principle of four and two stroke SI and CI engines

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Textbook:

[1] Mathur, Mehta and Tiwari, *Elements of Mechanical Engineering*, New Delhi: Jain Brothers, 2017.

Reference Books:

[1] Hazra Chowdary. S. K and Bose, *Basic Mechanical Engineering*, Media Promoters and Publishers Pvt. Ltd, 2010.

[2] P. K. Nag, *Engineering Thermodynamics*, New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd.

[3] Hazra Chowdary. S. K and Bose, *Workshop Technology, Vol. I & II*, Media Promoters and publishers Pvt Ltd, India.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: explain mechanical properties of an engineering materials and learn the steps in design methodology

CO2: describe the principles of manufacturing processes

CO3: apply first law of thermodynamics to various processes to calculate work and heat for a closed system

CO4: define second law of thermodynamics and demonstrate the working principle of IC engines

Course Articulation Matrix: U18OE401C ELEMENTS OF MECHANICALENGINEERING															
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18OE401C.1	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	U18OE401C.2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	U18OE401C.3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	U18OE401C.4	2	2	-	-	-	-	-	-	-	-	-	-	-	-
U18OE401C		**2**	**2**	-	-	-	-	-	-	-	-	-	-	-	-

U18OE401E FUNDAMENTALS OF COMPUTERNETWORKS

Class: B. Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	1	–	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : network topologies, network reference models, network architecture and data transmission

LO2 : design issues and protocols of data link layer, error detection and correction, MAC protocols and ethernet standards

LO3 : principles and design issues of network layer and internet protocols

LO4 : transport layer design issues, protocols and application layer services

UNIT - I (9)

Introduction: History of computer networks and the internet, principles of computer network design, network architecture, network types

Physical Layer: Factors Affecting data transmission, data transmission, data transmission codes: non-return to zero, Manchester encoding, digital modulation & modems, transmission media

UNIT- II (9)

Data Link Layer: Functions of data link layer, framing techniques, error detection and correction, elementary data link layer protocols for flow control

Local Area Networks: Medium Access Protocols, LAN Protocol Stack, ethernet Protocols, IEEE 802.11 LAN Standard: IEEE 802.11 protocol stack, wireless LAN topologies, Frames in IEEE802.11

UNIT - III (9)

The Network Layer: Network layer services, packet switching networks, the Internet Protocol(IP): IP header in IPv4, IP addressing in IPv4, Subnet addressing and Classless Inter-Domain Routing (CIDR), address resolution protocol, dynamic host configuration protocol, internet layer protocols, fragmentation and reassembly, IP Version 6: motivation for IPv6 development, features of IPv6, IPv6 Address Representation

Routing Protocols: Elements of routing protocol performance, flooding, distance-vector and link state routing protocols, hierarchical routing

UNIT - IV (9)

The Transport Layer: User datagram protocol, transmission control protocol, TCP state transition diagram, other TCP timers, TCP congestion control

The Application Layer: World Wide Web, Domain Name System, Electronic Mail

Network Security: Threats and vulnerabilities in computer networks, cryptographic algorithms, data encryption standard

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Textbook:

[1] Mayank Dave, *Computer Networks*, 2nd ed., Cengage Learning, 2014.

Reference Books:

[1] Forouzan, *Data Communication and Networking*, 5th ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2012.

[2] William Stallings, *Data and Computer Communications*, 9th ed., New Delhi: PHI Learning Pvt. Ltd., 2011.

[3] Andrew S.Tanenbaum , David J. Wetherall, *Computer Networks*, 5th ed., New Delhi: Pearson Education, 2011.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: describe various network topologies, architecture and techniques for data transmission modes

CO2: outline various design issues in data link layer and develop protocols to handle data link layer operation

CO3: describe various design issues and develop protocols for network layer

CO4: explain various design issues, protocols of transport layer & application layer services

Course Articulation Matrix: U18OE401E FUNDAMENTALS OF COMPUTERNETWORKS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE401E.1	2	1	-	1	-	1	-	-	-	-	-	1	-	-
CO2	U18OE401E.2	3	3	2	1	1	1	-	-	-	-	-	1	-	-
CO3	U18OE401E.3	3	3	2	2	1	1	-	-	-	-	-	1	-	-
CO4	U18OE401E.4	3	3	2	2	1	1	-	-	-	-	-	1	-	-
U18OE401E		**2.75**	**2.5**	**2**	**1.5**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**

U18MH402 PROFESSIONAL ENGLISH

Class: B. Tech.IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : reading skill and sub skills to comprehend the text

LO2 : vocabulary and using it appropriately to describe situations

LO3 : using phrasal verbs in speech and writing

LO4 : grammar and improve language ability to write effectively

Week	Topic Name
I	**I. Reading Comprehension-** Significance of Reading Skimming **II. Verbal Ability-** Synonyms **III. Grammar-**Articles
II	**I. Reading Comprehension-**Scanning **II. Verbal Ability-**Antonyms **III. Grammar-**Articles
III	**I. Reading Comprehension-** Critical Reading **II. Verbal Ability-** Sentence completion with correct alternative word/group **III. Grammar-**Prepositions
IV	**I. Reading Comprehension-** Intensive Reading **II. Verbal Ability-** Sentence completion with correct alternative word/group **III. Grammar-** Reported Speech
V	**I. Reading Comprehension-** Intensive Reading **II. Verbal Ability-** Jumbled Sentences **III. Grammar-** Error Detection
VI	**I. Reading Comprehension-** Inferential Reading **II. Verbal Ability-** Jumbled Sentences **III. Grammar-** Error Detection
VII	**I. Reading Comprehension-** Lexical Reading **II. Verbal Ability-** Phrasal Verbs **III. Grammar-** Tenses, Structures
VIII	**I. Reading Comprehension-** Read to Interpret **II. Verbal Ability-** Single Word Substitutes **III. Grammar-** Tenses, Uses
IX	**I. Reading Comprehension-** Read to Analyze **II. Verbal Ability-** Collocations **III. Grammar-** Tenses, Uses
X	**I. Reading Comprehension-** Read to Summarize **II. Verbal Ability-** Spellings **III. Grammar,** Agreement between Subject & verb(concord)

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Textbooks:

[1] *Professional English Manual*, Department of English, KITSW

[2] Arun Sharma & Meenakshi Upadhyay, *Verbal Ability and Reading Comprehension for CAT & Other Management Examinations*,8th ed., New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2018

Reference Books:

[1] Nishit K. Sinha, *Verbal Ability and Reading Comprehension for the CAT*, 3rd ed., Chennai: Pearson India Education Services Pvt. Ltd.

[2] Harper Collins, *Collins COBUILD English Grammar*, 3rd ed., Harper Collins PublishersLtd.

[3] Rosemary & Courtney, *Longman-English-Chinese Dictionary of PhrasalVerbs*

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: analyze the passage using skill and sub skill to solve different types of questions related to reading comprehension

CO2: identify grammatical errors in the given sentences and correct them

CO3: select correct synonyms/antonyms/phrasal verbs and complete sentences with suitable words or phrases

CO4: keep the given jumbled sentences in proper sequence to make a coherent paragraph

Course Articulation Matrix: U18MH302/402 PROFESSIONALENGLISH

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18MH402.1	-	-	-	-	-	-	-	-	1	2	-	1	-	-
CO2	U18MH402.2	-	-	-	-	-	-	-	-	1	2	-	1	-	-
CO3	U18MH402.3	-	-	-	-	-	-	-	-	1	2	-	1	-	-
CO4	U18MH402.4	-	-	-	-	-	-	-	-	1	2	-	1	-	-
U18MH402		-	-	-	-	-	-	-	-	1	2	-	1	-	-

U18OE403A OBJECT ORIENTED PROGRAMMING

Class: B. Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : fundamentals of object oriented and java programming

LO2 : classes, objects and inheritance for implementing object oriented concepts

LO3 : polymorphism, interfaces and packages for realizing object oriented programming

LO4 : manage Exceptional and I/O operations in application developments

UNIT- I (9)

Fundamentals of Object-Oriented Programming: Programming paradigms, basic concepts of Object Oriented paradigm (OOP), benefits and applications of OOP

Basics of Java Language: Java language Features, Java programming structure, Java tokens, JVM, constants, variables, data types, scope of variable, type casting, operators and expressions, branching and looping statements, arrays

UNIT – II (9)

Classes and Objects: Defining a class, field declaration, method declaration, creating object, accessing class members, constructors, garbage collection, static members, nested and inner classes, command line arguments, wrapper classes

Inheritance: Extending a class, defining subclasses, subclass constructor, multilevel inheritance, hierarchical inheritance, access controls, *this* and *super* keywords

UNIT-III (9)

Polymorphism: Overloading methods, overloading constructors, overriding methods, dynamic method dispatch, abstract classes, final keyword

Interfaces: Defining an interface, implementing interfaces, nested interfaces, variables in interfaces, extending interfaces

Packages: Packages, Java API packages, using system packages, naming conventions, creating packages, accessing packages, adding a class to package, hiding classes, static import

UNIT – IV (9)

Exception handling: Fundamentals, exception types, uncaught exceptions, using try and catch, multiple catch clauses, explicit exceptions with *throw, throws* and *finally* keywords

String Handling: String constructors, string length, string operations, character extraction, string comparison, searching string, modifying string, changing string cases, joining strings

Using I/O: I/O basics, reading console input, writing console output, reading and writing files

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Textbooks:

[1] Herbert Schildt, *JAVA: The Complete Reference*, 9th ed., New Delhi: McGraw-Hill Education India Pvt. Ltd., 2014.

[2] E. Balgurusamy, *Programming with JAVA a primer*, 5th ed., New Delhi: McGraw-Hill Education India Pvt. Ltd., 2014.

References Books:

[1] P Radha Krishna, *Object Oriented Programming through JAVA*, Universities Press, 2011.

[2] Herbert Schildt, JAVA The Complete Reference, 9th ed., New Delhi: McGraw-Hill Education India Pvt. Ltd., 2011.

[3] Kathy Sierra, Bert Bates, *Head First Java*, 2nd ed., O'Reilly Publications.

[4] Uttam K.Roy, *Advanced JAVA Programming*, New Delhi: Oxford Publications.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: demonstrate object oriented concepts and java programming features

CO2: solve computing problems using object orientation and inheritance concepts

CO3: use polymorphism, interfaces and Packages for effective object oriented programming

CO4: handle Exceptions and I/O operations in application development

Course Articulation Matrix: U18OE303/U18OE403 OBJECT ORIENTEDPROGRAMMING														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18OE403A.1	2	2	2	1	2	1	-	1	2	1	2	1	-	-
CO2	U18OE403A.2	2	2	2	1	2	1	-	-	2	1	2	1	1	-
CO3	U18OE403A.3	2	2	2	1	2	1	-	-	2	1	2	1	1	-
CO4	U18OE403A.4	2	2	2	1	2	1	1	1	2	1	2	1	1	-
U18OE403A		2	2	2	1	2	1	1	1	2	1	2	1	1	-

U18OE403B FLUID MECHANICS AND HYDRAULIC MACHINES

Class: B. Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : various Properties of fluids and fluid statics

LO2 : application of Bernoulli's equation and dimensional analysis

LO3 : flow through pipes and working principles of hydraulic turbines

LO4 : performance of reciprocating and centrifugal pumps

UNIT-I (9)

Fluid fundamentals: Classification of fluids, fluid properties - density, specific weight, specific gravity, specific volume, viscosity, capillarity, vapor pressure, compressibility, surface tension, cohesion and adhesion

Fluid statics: Pascal's Law, hydrostatic Law, measurement of pressure, manometers, piezometer, U-tube differential manometer, inverted differential manometer, hydrostatic forces on submerged plane and curved surfaces, buoyancy, metacenter, stability of floating and submerged bodies

UNIT-II (9)

Fluid dynamics: Classification of fluid flow, continuity equation in one, two and three dimensional flow, velocity potential and stream function, forces causing motion, Euler's equation of motion, Bernoulli's Equation, applications of Bernoulli's equation, venturi meter, orifice meter, pitot tube, linear momentum equation, application of linear momentum equation to forces on pipe bend

Dimensional analysis: Dimensional analysis by Rayleigh's method and Buckingham π's theorem, dimensionless numbers and model laws, Reynolds law and Froude's law

UNIT-III (9)

Flow through pipes: Loss of head in pipes, expression for head loss due to major and minor losses in pipes, HGL and TEL lines, pipes in series and parallel, equivalent pipe

Hydraulic turbines: Concept of impact jets, classification, head, losses and various efficiencies, Pelton turbines, components, velocity triangles, power and efficiencies, reaction turbines, Francis and Kaplan turbines, efficiencies and characteristics, unit quantities, specific speed, draft tube theory

UNIT-IV (9)

Reciprocating pumps: Working of single and double acting pumps, work done and efficiencies, slip, negative slip, performance characteristics of pumps, air vessel

Centrifugal pumps: Principle, components, work done and efficiency, pumps in series and in parallel, multistage pumps, characteristics, cavitation and priming

Textbook:

[1] P.N. Modi and S.M. Seth, *Hydraulics and Fluid Mechanics Including Hydraulic Machines*,21st ed., New Delhi: Standard Book House, Rajsons Publications Private Limited, 2017

Reference Books:

[1] R.K.Bansal, *Fluid Mechanics and Hydraulic Machines*, Periodicals PrivateLtd.,2018

[2] Victor Streeter and E. Benjamin Wylie, *Fluid Mechanics*, 9th ed., Singapore: McGraw Hill, , 2017.

[3] Frank M. White, *Fluid Mechanics*, Special Indian Edition, New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2011.

[4] A.K. Jain, *Fluid Mechanics Including Hydraulic Machines*, 12th ed., New Delhi: Khanna Publications,2018.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: summarize fluid properties using fundamental laws of fluid statics

CO2: analyse fluid flows using Bernoulli's equation and model laws

CO3: estimate losses in pipes and characterize hydraulic turbines

CO4: discuss the working principle and characteristics of pumps

Course Articulation Matrix: U18OE403B FLUID MECHANICS AND HYDRAULICMACHINES

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18CE403B.1	2	1	-	-	-	-	-	-	1	1	-	1	-	-
CO2	U18CE403B.2	2	1	-	1	-	-	-	-	1	1	-	1	-	-
CO3	U18CE403B.3	2	1	-	1	-	-	-	-	1	1	-	1	1	-
CO4	U18CE403B.4	2	1	-	1	-	1	-	-	1	1	-	1	1	-
U18CE403B		**2**	**1**	**-**	**1**	**-**	**1**	**-**	**-**	**1**	**1**	**-**	**1**	**1**	**-**

U18OE403C MECHATRONICS

Class: B. Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1 : role of mechatronics-based technology, sensors and transducers used in industry

LO2 : various types of actuation systems, working principles and their applications

LO3 : mathematical models for various types of systems

LO4 : various transfer functions and control modes

UNIT-I (9)

Introduction to Mechatronics: Measuring system, control systems, microprocessor based controllers, mechatronics approach

Sensors and Transducers: Performance, terminology, displacement, position, proximity, velocity and motion

UNIT-II (9)

Actuation Systems: working principles of pneumatic and hydraulic systems, directional control valves, pressure control valves, process control valves and rotary actuators

Electrical Actuation Systems: working principles of electrical system, mechanical switches, solid-state switches solenoids, DC motors, AC motors and stepper motors

UNIT-III (9)

Basic Models: Mathematical models, mechanical system building blocks, electrical system building blocks, fluid system building blocks and thermal system building blocks

System Models: Engineering system, rotational-translational system and electro- mechanical systems and hydraulic-mechanical system

UNIT-IV (9)

System Transfer functions: Transfer function, first order system, second order system, system in series and systems with feedback loops

Closed Loop Controllers: Continuous and discrete processes, control modes, two step mode and proportional mode, derivative control, integral control, PID controller, digital controllers, velocity controllers and adaptive control

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Textbook:

[1] Bolton W., *Mechatronics*, 6th ed., New Delhi: Pearson Publications, 2015.

Reference Books:

[1] Nitaigour Premchand Mahalik, *Mechatronics: Principles Concepts and Applications*, 2nd ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd.,2017.

[2] HMT, *Mechatronics*, New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd.,2000.

[3] Devdas Shetty, Richard and Kilk, *Mechatronics System and Design*, 2nd ed., CengageLearning, 2010.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: apply the mechatronics approach ad select suitable sensors and transducers for a given application

CO2: explain working principles of mechanical, hydraulic, pneumatic and electrical actuators and their applications

CO3: develop basic building blocks for mechanical, electrical, fluid and thermal systems and build mathematical models and analyze

CO4: explain various system transfer functions and select an appropriate closed loop controller for a given application

Course Articulation Matrix: U18OE403C MECHATRONICS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE403C.1	2	2	1	-	2	2	-	-	-	1	-	1	1	-
CO2	U18OE403C.2	2	2	1	-	2	-	-	-	-	1	-	1	2	-
CO3	U18OE403C.3	2	2	1	3	2	-	-	-	-	1	-	1	2	-
CO4	U18OE403C.4	2	2	1	1	2	-	-	-	-	1	-	1	2	-
U18OE403C		2	2	1	2	2	2	-	-	-	1	-	1	1.75	-

U18OE403D WEB PROGRAMMING

Class: B. Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : designing static webpage using HTML Tags, CSS properties, interactivity with JavaScript

LO2 : creating dynamic webpage using JSP

LO3 : developing server-side scripts for web applications using PHP

LO4 : building databases applications using PHP, MYSQL and XML

UNIT-I (9)

HTML: Document structure, basic tags, creating headings, working with links, creating paragraph, working with images, tables, frames, Introduction to forms and controls: creating HTML form, specifying action URL and method to send the form, using HTML controls

CSS:*CSS* (Cascading style sheet) rules and properties, types: inline, external and internal style sheets, style classes, multiple styles

JAVASCRIPT: JavaScript syntax, embedding JavaScript in HTML page. usage of variables, working with operators, control-flow statements, functions and array, creating objects, handling events

UNIT-II (9)

JSP: Syntax and semantics, JSP development model, components of JSP page: directives, comments, Expressions, Scriptlets, declarations, implicit objects, standard actions, tag extensions, a complete JSP example, Session and thread management: session tracking, session API, thread management. application event listeners

JDBC: Database access with JDBC, overview, JDBC drivers, connecting to database with driver manager, statement interfaces: statement, prepared statement, callable statement, result sets

UNIT-III (9)

Introduction to PHP: Overview of PHP, advantages of PHP over scripting languages, creating and running a php script, handling errors, working with variables and constants: variables, data types and operators, Controlling

Program Flow: Conditional Statements, looping statements, break, continue and exit statements, Working with functions, arrays, files and directories

Working with Forms: Web forms and form elements, processing a web form, validating a web form

UNIT-IV (9)

Database using PHP: Exploring relational database model, records and primary keys. working with SQL statements. Using PHP and MYSQL: checking configuration, connecting to database, selecting a database,

adding and altering a table in a database, inserting and modifying data in a table, retrieving data from a table

XML: Introduction to XML, XML basics: syntax, declaration, elements, attributes, Valid XML Documents, Viewing XML, XML Parser, XML technologies, Document Object Model(DOM)

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Textbooks:

[1] Kogent, *Web Technologies HTML, CSS, JavaScript, ASP.NET, Servlets, JSP, PHP, ADO.NET, JDBC and XML*, Dreamtech Press (Black Book), 2013.

[2] Phil Hanna, *JSP: The Complete Reference*, 2nd ed., New Delhi: McGraw Hill Education (India) Pvt. Ltd.,2001.

Reference Books:

[1] Ivan Bayross, *Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP*, 4th ed., BPB Publications,2009.

[2] UttamK.Roy, *Web Technologies*, 7th ed., New Delhi: Oxford Higher Education, 2010.

[3] Luke Welling, Laura Thomson, *PHP and MySQL Web Development*, 3rd ed., SamsPublications,2005.

[4] Jayson Falkner, Kevin Jones, *Servlets and Java Server Pages*, New Delhi: Pearson Publications, 2003

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: create static web pages using HTML Tags, CSS properties and Java scripts

CO2: create dynamic web pages using java server page concepts

CO3: develop web server side applications using PHP concepts

CO4: develop enterprise databases for web-based applications using PHP and MySQL

Course Articulation Matrix: U18OE403D WEB PROGRAMMING

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE403D.1	2	2	2	1	2	1	-	1	2	1	2	1	1	-
CO2	U18OE403D.2	2	2	2	1	2	1	-	1	2	1	2	1	1	-
CO3	U18OE403D.3	2	2	2	1	2	1	-	1	2	1	2	1	1	-
CO4	U18OE403D.4	2	2	2	1	2	1	1	1	2	1	2	1	1	-
U18OE403D		2	2	2	1	2	1	1	1	2	1	2	1	1	**-**

U18OE403F STRENGTH OFMATERIALS

Class: B. Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : behaviour of bodies subjected to various types of stresses and strains

LO2 : shear force and bending moment for determinate beams

LO3 : bending and shearing stresses for beams in flexure

LO4 : behaviour of circular shafts, springs and thin cylinders

UNIT-I (9)

Simple stresses and strains: Types of stresses, strains, stress–strain diagram, elastic limit, Hooke's law, bars of varying sections, uniformly tapering circular and rectangular sections, elongation of bars due to self weight, temperature stresses in uniform bars

Elastic modulii: Elastic constants, longitudinal strain, lateral strain, Poisson's ratio, complimentary shear stress, state of simple shear, modulus of elasticity (E), modulus of rigidity (N), bulk modulus (K), relation between E, N & K, strain energy, resilience, impact loading

UNIT-II (9)

Principal stresses: Definition, normal and shear stress, principal stresses, principal planes and their graphical representation by Mohr's circle

Shear force and bending moment: Types of supports, classification of beams, concept of shear force and bending moment, shear force diagram and bending moment diagram for simply supported, cantilever and overhanging beams, loading from shear force and bending moment diagram, principle of superposition

UNIT-III (9)

Bending stresses in beams: Assumptions, theory of simple bending, application of bending equation and calculation of bending stresses in beams of homogeneous and flitched beam material, beams of uniform strength

Shearing stresses in beams: Shearing stress due to bending, variation of flexural shear stress distribution across rectangular, triangular, circular, flanged section, shear resilience

UNIT-IV (9)

Circular shafts and springs: Theory of pure torsion in solid and hollow circular shafts, shear stresses, angle of twist, power transmitted by shaft, close-coiled and open-coiled helical spring subjected to axial load and axial twist, springs in series and parallel

Thin cylinders: Analysis of thin-walled pressure vessels, hoop stress, longitudinal stress

Textbooks:

[1] Rajput R.K., *Strength of Materials*, 7th ed., New Delhi: S. Chand & Company Ltd.

[2] Gunneswara Rao T. D. and Mudimby Andal, *Strength of Materials*, Cambridge: Cambridge University Press, 2018.

Reference Books:

[1] Timoshenko and Gere, *Mechanics of Materials*, New Delhi: McGraw Hill Education (India) Pvt. Ltd.

[2] Punmia B.C., Arun K. Jain, Ashok K. Jain, *Mechanics of Materials*, 2nd ed., New Delhi: Laxmi Publications.

[3] Subramanian R., *Strength of Materials*, 3rd ed., Oxford: Oxford UniversityPress.

[4] Ramamrutham S., *Strength of Materials*, 2nd ed., New Delhi: Dhanpat Rai & Sons.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: estimate various types of stresses and strains

CO2: construct Mohr's circle, shear force and bending moment diagrams for determinate beams

CO3: determine the bending and shearing stresses for beams subjected to pure bending

CO4: analyze stresses in thin cylinders, circular shafts and springs by theory of pure torsion

Course Articulation Matrix: U18OE403F STRENGTH OF MATERIALS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE403F.1	2	2	1	1	-	-	-	-	-	1	-	2	1	-
CO2	U18OE403F.2	2	2	1	-	-	-	-	-	-	1	-	1	1	-
CO3	U18OE403F.3	2	2	1	1	-	-	-	-	-	-	-	1	1	-
CO4	U18OE403F.4	2	2	1	2	-	-	-	-	-	1	-	1	1	-
U18OE403F		**2**	**2**	**1**	**1.33**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1.25**	**1**	**-**

U18EE404 POWER SYSTEMS -I

Class: B. Tech. IV-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : issues related to generation of electrical energy using fossil fuel based and renewable energy sources

LO2 : economics of power generation and tariffs

LO3 : underground cables and voltage distribution on insulators

LO4 : parameters of transmission lines

UNIT – I (9)

Conventional Energy Sources: Hydroelectric Stations: – types of hydroelectric plant – principle of working– layout of hydro power station: steam power plant, selection of site – coal handling plant – ash handling plant – steam generating plant – steam turbine & generator – cooling water systems: nuclear power plant: types of reactors – location of nuclear power plant, gas turbine power plant: introduction to gas turbine plant – advantages

UNIT – II (9)

Renewable Energy Sources: Introduction to solar power, wind power

Economics of Power Generation: Definitions, connected load, maximum demand, demand factor, load factor, diversity factor, load duration curve, number and size of generating units, base load and peak load plants, cost of electrical energy, fixed cost, running cost, tariffs

UNIT – III (9)

Insulators: Types, potential distribution over a string of suspension insulators, factors affecting the distribution of voltage along the string insulators, methods of equalizing potential string efficiency, stringing charts, testing of insulators

Under Ground cables: Electric stress in a cable, grading of cables, cable capacitance, cable inductance, dielectric loss and heating

UNIT – IV (9)

Distribution Lines: Distribution systems, DC two wire and three wire systems. single phase and three phase 3-wire and 4-wire AC systems – comparison of efficiency, Kelvin's law – economic size of conductor

Transmission Lines: Calculation of resistance, inductance and capacitance of transmission lines, single phase and 3-phase lines with symmetrical and asymmetrical spacing, composite conductors – transposition, bundled conductors, effect of earth on capacitance, mechanical design of transmission lines

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Textbooks:

[1] C.L. Wadhwa, *Generation, Distribution & Utilization of Electrical Energy*, 6th ed., New Delhi: New Age International Pvt. Ltd., 2014.

[2] S.N. Singh, *Electric Power Generation, Transmission & Distribution*, 2nd ed., New Delhi: PHI Learning Pvt. Ltd., 2009.

Reference Books:

[1] A. Chakrabarti, ML Son, PV Gupta, US Bhatnagar, A Text Book on Power System Engineering, 2nd ed., New Delhi: Dhanpat Rai publishing company pvt. ltd., 2006.

[2] Ned Mohan, *Electric Power Systems*, New Delhi: Wiley India Pvt. Ltd., 2014.

[3] Syed A Nasar, *Electric Power Systems*, New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2006

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: describe the operation of fossil fuel based and renewable generating stations

CO2: analyze different types of tariff's in power system

CO3: determine distribution of voltage along the string insulators

CO4: determine circuit parameters of transmission lines

Course Articulation Matrix: U18EE404 POWER SYSTEMS - I

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE404.1	3	2	2	2	-	1	1	-	-	-	-	-	2	2
CO2	U18EE404.2	3	2	2	2	-	1	1	-	-	-	-	-	2	2
CO3	U18EE404.3	2	2	2	2	-	-	-	-	-	-	-	-	2	2
CO4	U18EE404.4	2	2	2	2	-	-	-	-	-	-	-	-	2	2
U18EE404		2.5	2	2	2	-	1	1	-	-	-	-	-	2	2

U18EE405 ELECTRICAL MACHINES –I

Class: B. Tech. IV-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : basic principles of magnetic circuits, electro mechanical energy conversion and construction of electrical machines

LO2 : principle, effects of armature reaction, commutation, characteristics and applications of DC generators

LO3 : principle, characteristics, starting, speed control, testing and applications of DC motors

LO4 : principle, construction, testing and applications of 1-phase and 3-phase transformers

UNIT – I (9+3)

Magnetic circuits and basic principles of rotating electrical machines: Principles of electromechanical energy conversion, singly and doubly excited systems, basic constructional features of rotating electrical machines

UNIT – II (9+3)

DC Generators: Principle of operation, armature windings, simplex and multiplex lap and wave windings (elementary treatment), types of DC generators, EMF equation, armature reaction-demagnetizing and cross magnetizing ampere turns, interpoles, compensating windings, commutation-reactance voltage, methods of improving commutation, methods of excitation, separately and self-excited generators, voltage buildup process in shunt generators, critical field resistance and critical speed, characteristics & applications of shunt, series & compound generators

UNIT – III (9+3)

D.C. Motors: Principle of operation, back emf, torque equation, classification, starters (3 point & 4-point), operating characteristics and speed control, applications, losses, efficiency and testing of dc machines-brake test, Swinburne's test, Hopkinson's test, Field's test

UNIT – IV (9+3)

Single Phase Transformers: Constructional features, principle of operation, EMF equation, operation on no-load and on-load, development of equivalent circuit, determination of equivalent circuit parameters, phasor diagrams, losses, ordinary efficiency and all day efficiency, voltage regulation, determination of performance by Open Circuit (OC), Short Circuit (SC) tests and Sumpner's test, parallel operation, load sharing, auto transformer- principle of working, saving of copper as compared to two winding transformer and applications

Three Phase Transformers: Types of connections, relation between line and phase voltages and currents, three winding transformer, use of tertiary winding, Scott connection of transformers, tap changing of transformers- off-load and on-load, induction regulator

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Textbooks:

[1] Bimbhra P.S., *Electric Machinery*, 7th ed., New Delhi: Khanna Publisher, 2014

[2] Bimbhra P.S., *Generalized Machine Theory*, 5th ed., New Delhi: Khanna Publisher,2014

Reference Books:

[1] S.K. Sahadev, *Electrical Machines*, Cambridge: Cambridge University press,2018

[2] A.E. Fitzgerald, Kingsly, Stephen., *Electric Machinery*, New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd.,2015

[3] Nagrath and Kotari, *Electrical Machines*, 4th ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd.,2004.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: analyze the principles of magnetic circuits, electro mechanical energy conversion and understand construction of electrical machines

CO2: analyze the effects of armature reaction, commutation and calculate demagnetizing (ATd), cross magnetizing (ATc) ampere turns, critical field resistance and critical speed for DC generators

CO3: compare various speed control methods and determine efficiency of DC machines by different testing methods

CO4: evaluate the performance of 1- phase transformers and distinguish various connections of 3- phase transformers and its applications

Course Articulation Matrix: U18EE405 ELECTRICAL MACHINES – I

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE405.1	3	2	-	1	-	-	-	-	-	-	-	-	2	2
CO2	U18EE405.2	3	2	1	1	1	-	-	-	-	-	-	-	2	2
CO3	U18EE405.3	3	2	1	1	1	-	-	-	-	-	-	-	2	2
CO4	U18EE405.4	3	2	1	1	1	-	-	-	-	-	-	-	2	2
U18EE405		**3**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**

U18EC412 ANALOG AND DIGITALELECTRONICS

Class: B. Tech. IV-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : single stage amplifiers, multistage amplifiers

LO2 : power amplifiers, feedback amplifiers and oscillator circuits analysis

LO3 : number systems, codes and Boolean algebra

LO4 : combinational circuits and sequential circuits

UNIT-I (9)

Small Signal Amplifiers: Review of BJT biasing and operating point, Analysis of BJT small signal low frequency h-parameter model - CE, CB and CC configurations, High frequency transistor amplifier – analysis of the Hybrid- (pi) Common Emitter transistor model

Multistage Amplifiers: RC coupled Amplifier, Direct and Transformer Coupled Amplifiers, effect of cascading on gain and bandwidth, Darlington Pair, cascade amplifier, differential amplifier and bootstrap amplifier

UNIT-II (9)

Large Signal Amplifiers: Series fed and Transformer coupled Class-A, Class-B power amplifiers, Class-AB power amplifiers, Push-Pull amplifier and Complementary-Symmetry pair

Feedback Amplifiers: General characteristics of negative feedback amplifiers, Effect of negative feedback on amplifier characteristics, Analysis of Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback amplifiers

Oscillators: Conditions for oscillation, RC and LC oscillators, Crystal Oscillator

UNIT-III (9)

Number systems and Codes: Review of number systems, binary arithmetic, binary weighted and non-weighted codes, error detecting and error correcting codes

Boolean Algebra: Postulates and theorems, logic gates and truth tables, representation, minimization and realization of switching functions, SOP & POS forms, minimization using Karnaugh map and Quine - McClusky Techniques

UNIT-IV (9)

Combinational circuits: Design of combinational circuits using logic gates – Half adder, Full adder, Half subtractor, Full subtractor, Parallel adder, Serial adder, Carry look ahead adder, BCD adder, 1's and 2's Complement Adder/Subtractors, Decoders - BCD to 7 segment, BCD to Decimal decoders, Encoders-Priority encoders, Multiplexers, Demultiplexers, Realization of switching functions using multiplexers

and decoders, Parity generators, Comparators

Sequential circuits: Flip flops – SR, JK, D and T Flip flops, Truth tables, Excitation tables, Race around condition, Master slave flip flop, Binary counters – Design of synchronous and Asynchronous counters, Shift registers – Modes of operation, Bidirectional shift registers, Ring counter and Johnson counter

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Textbooks:

[1] Jacob .Millman and C.C.Halkias, *Integrated Electronics*, 2nd ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 1991.

[2] Donald A Neamen, *Electronic Circuits Analysis and Design*, 3rd ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd.,2009.

[3] Moris Mano, M.D. Cilletti, *Digital Design*, 4th ed., New Delhi: PHI Learning Pvt. Ltd., 2006.

Reference Books:

[1] S. Sedra and Kenneth C. Smith, *Microelectronic Circuits*, Oxford: Oxford UniversityPress,2014.

[2] A. Anand Kumar, Switching Theory & Logic Design, New Delhi: PHI Learning Pvt. Ltd., 2014.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: design single stage and multistage amplifiers

CO2: analyze feedback amplifier, power amplifiers and design the oscillators circuits

CO3: implement the error detection, correction codes and minimize the Boolean functions

CO4: realize the combinational and sequential circuits

Course Articulation Matrix: U18EC412 ANALOG AND DIGITAL ELECTRONICS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC412.1	3	3	2	-	-	-	2	-	-	-	-	-	2	1
CO2	U18EC412.2	3	3	2	-	-	-	2	-	-	-	-	-	2	1
CO3	U18EC412.3	3	3	3	-	-	-	2	-	-	-	-	-	1	-
CO4	U18EC412.4	3	3	3	-	-	-	2	-	-	-	-	-	2	1
U18EC412		**3**	**3**	**2.5**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**1.75**	**1**

U18EE407 ELECTRICAL MACHINES -ILABORATORY

Class: B. Tech. IV-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in /on …

LO1 : performance characteristics of DC machines by conducting various tests

LO2 : predetermination of performance of DC motors and transformer

LO3 : performance characteristics of 1- phase transformers by conducting various tests

LO4 : understanding of connections of 3- phase transformers

LIST OF EXPERMENTS

1. Determination of open circuit characteristics of DC shunt generator
2. Determination of load characteristics of DC shunt generator
3. Determinations of performance characteristics of DC shunt motor by brake test
4. Determination of performance characteristics of DC series motor by brake test
5. Determination of performance characteristics DC compound motor by brake test
6. Predetermination of efficiency of DC machine by Swinburne's test
7. Speed Control of DC Shunt motor using i). Armature voltage control, ii). Field flux control
8. Determination of voltage regulation and efficiencyof1-phase transformer by conducting load test
9. Predetermination of efficiency of 1- phase transformer by open circuit and short circuit tests
10. Determination of efficiencyof1- phase transformer by conducting Sumpner's test
11. Parallel operation of two1- phase transformers
12. Conversion of 3- phase to 2-phase supply by using Scott connection

Additional Study Experiments

1. Study of DC Starters
2. Study of constructional parts of DC machines
3. Study of constructional parts of 1- phase transformers
4. Study of constructional parts of 3- phase three winding transformer

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Laboratory Manual

[1] *Electrical Machines -I Laboratory Manual*, Department of EEE, KITSW

Reference Book:

[1] S.G. Tarnekar, P.K. Kharbanda, S.B. Bodkhe, SD Naik, DJ Dahigaonkar, *Laboratory Courses in Electrical Engineering*, New Delhi: S. Chand & Company Limited.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: obtain performance characteristics of DC generators

CO2: determine performance characteristics of DC motors and transformers

CO3: predetermine the performance characteristics of DC machines using Swinburne's test and transformers using OC, SC tests

CO4: acquire hands-on experience on connections of 3-phase transformers

Course Articulation Matrix: U18EE407 ELECTRICAL MACHINES -I LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE407.1	3	2	-	1	1	-	-	1	3	2	-	-	2	2
CO2	U18EE407.2	3	2	-	1	1	-	-	1	3	2	-	-	2	2
CO3	U18EE407.3	3	2	-	1	1	-	-	1	3	2	-	-	2	2
CO4	U18EE407.4	3	2	-	1	1	-	-	1	3	2	-	-	2	2
U18EE407		**3**	**2**	**-**	**1**	**1**	**-**	**-**	**1**	**3**	**2**	**-**	**-**	**2**	**2**

U18EC413 ANALOG AND DIGITAL ELECTRONICS LABORATORY

Class: B. Tech. IV-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in /on …

LO1 : analysis of single & multistage amplifier circuits

LO2 : constructing the Negative feedback amplifiers and oscillators

LO3 : realizing combinational circuits

LO4 : implementing sequential circuits

LIST OF EXPERIMENTS

I) Analog Electronics:

1. Common Emitter Amplifier
2. Two Stage RC Coupled Amplifier
3. Voltage Series Feedback Amplifier
4. RC Phase Shift Oscillator
5. Single Tuned Voltage Amplifier
6. Class A Power Amplifier (with transformer load)

II) Digital Electronics:

1. Realization of Logic Gates.
2. Adders and Subtractors.
3. BCD to Excess-3 code converter and Binary to Gray code converter.
4. Multiplexer and Demultiplexer.
5. Decoders and Encoders.
6. Flipflops.
7. Shift registers.
8. Asynchronous and Synchronous counters.

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Laboratory Manual:

[1] *Analog and Digital Electronics Laboratory manual*, Department of ECE, KITSW.

Reference Books:

[1] Jacob .Millman and C.C. Halkias, *Integrated Electronics*, 2nd ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 1991.

[2] Moris Mano, M.D. Cilletti, *Digital Design*, 4th ed., New Delhi: PHI Learning Pvt. Ltd., 2006.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: design and analyze single stage and multistage amplifier circuits.

CO2: design and analysis of Negative feedback amplifiers and oscillators

CO3: design and verify the combinational circuits

CO4: design and implement sequential circuits

Course Articulation Matrix: U18EC413 ANALOG AND DIGITAL ELECTRONICS LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC413.1	3	2	2	3	3	-	1	-	3	2	2	-	2	1
CO2	U18EC413.2	3	2	2	3	3	-	1	-	3	2	2	-	1	1
CO3	U18EC413.3	3	2	2	3	3	-	1	-	3	2	2	-	2	1
CO4	U18EC413.4	3	2	2	3	3	-	1	-	3	2	2	-	2	1
U18EC413		**3**	**2**	**2**	**3**	**3**	**-**	**1**	**-**	**3**	**2**	**2**	**-**	**1.75**	**1**

U18OE411A OBJECT ORIENTED PROGRAMMINGLABORATORY

Class: B. Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in /on …

LO1 : implementing concepts of object oriented programming

LO2 : debug and test java applications effectively

LO3 : effective use of exception handling, interfaces and packages during applications development

LO4 : I/O and applet programming in java

LIST OF EXPERIMENTS

Experiment -I

1. Write a program to demonstrate operators of Java
2. Write a program to demonstrate type casting and operator precedence
3. Write a program to demonstrate different types of if-statements
4. Write a program to demonstrate switch-case

Experiment-II

1. Write a program to demonstrating loop control statements
2. Write a program to demonstrate for-each control loop
3. Implement programs using single dimensional arrays
4. Write a program to define a two-dimensional array where each row contains different number of columns

Experiment -III

1. Write a program to demonstrate creating object to a class for accessing variables and methods
2. Write a program to demonstrate creating multiple object
3. Write a program to demonstrate passing objects to methods
4. Write a program to demonstrate constructors and garbage collector by invoking it explicitly

Experiment -IV

1. Write a program to demonstrate static members
2. Write a program to demonstrate command line argument
3. Write a program to demonstrate variable length argument
4. Write a program to demonstrate wrapper classes

Experiment -V

1. Write a program to demonstrate inheritance using extends keyword
2. Write a program to demonstrate multilevel inheritance
3. Write a program to demonstrate hierarchical inheritance
4. Write a program to demonstrate access controls

Experiment -VI

1. Write program to demonstrate *this* and *supper* keywords
2. Write program to demonstrate dynamic method dispatch
3. Write a program to demonstrate final variable and methods
4. Write a program to demonstrate use of abstract class

Experiment -VII

1. Write a program to define an Interface and implement it into a class
2. Write a program to implement multiple interfaces into single class
3. Write a program to extend interfaces
4. Write a program to implement nested interfaces

Experiment -VIII

1. Write a program to create a package, and demonstrate to import a package to a class
2. Write a program to demonstrate access protection of packages
3. Write a program to demonstrate static import of package

Experiment-IX

1. Write a program to demonstrate *try* and *catch* statement for exception handling
2. Handle *Array Index of Bounds Exception*, *Number Format Exception* and *Divide By Zero Exception* using multiple catch blocks
3. Write a program to demonstrate user defined exception with *throw keyword*
4. Write a program to demonstrate *finally* block

Experiment-X

1. Write a program to demonstrate string handling functions
2. Write a program to demonstrate string searching functions
3. Write a program to demonstrate string comparison functions
4. Write a program to demonstrate string modification functions

Experiment-XI

1. Write a program to demonstrate reading and writing input using byte stream classes
2. Write a program to demonstrate reading and writing input using character stream classes
3. Write a program to demonstrate data input and output streams
4. Write a program to demonstrate array input and output streams

Experiment-XII

1. Write a program to create a file using byte stream classes
2. Write a program to create a file using character stream classes
3. Write a program to open the specific file
4. Write a program to copy the content of one file to another

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Laboratory Manual:

[1] *Java Programming Laboratory Manual*, Department of CSE, KITSW.

Reference Book:

[1] Herbert Schildt, *JAVA The Complete Reference*, 9th ed., New Delhi: McGraw-Hill Education India Pvt. Ltd , ISBN: 9781259002465,2014.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: implement OOP concepts using Java
CO2: use the concepts like inheritance, polymorphism, packages and interfaces in application development
CO3: handle runtime exceptions in object oriented programming
CO4: build effective I/O interfaces for software applications

Course Articulation Matrix: U18OE411A OBJECT ORIENTED PROGRAMMING LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE411A.1	2	2	2	1	2	1	-	1	2	1	2	1	1	-
CO2	U18OE411A.2	2	2	2	1	2	1	1	-	2	1	2	1	1	-
CO3	U18OE411A.3	2	2	2	1	2	1	-	-	2	1	2	1	1	-
CO4	U18OE411A.4	2	2	2	1	2	1	1	1	2	1	2	1	1	-
U18OE411A		2	2	2	1	2	1	1	1	2	1	2	1	**1**	**-**

U18OE411B FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY

Class: B. Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in /on …

LO1 : determining the hydraulic coefficient for various flow measuring devices

LO2 : implementing Bernoulli's equation and application of Bernoulli's theorem in estimating various losses in pipe

LO3 : studying the various parameters which effects the impact of jet

LO4 : studying the characteristics of hydraulic machines

LIST OF EXPERIMENTS

1. Determination of Coefficient of Discharge for given Orifice meter and Venturi meter
2. Determination of Coefficient of Discharge for given notches (triangular/rectangular)
3. Determination of Coefficient of Discharge for given orifice and mouth piece
4. Verification of Bernoulli's theorem
5. Estimation of coefficients of various head losses in pipes due to major and minor losses (sudden enlargement, sudden contraction and bend)
6. Determination of Reynolds's number using Reynolds's apparatus
7. Determination of coefficient of impact for a jet on given vane
8. Determination of performance characteristics of Francis Turbine
9. Determination of performance characteristics of Pelton Wheel
10. Determination of performance characteristics of Centrifugal Pump
11. Determination of performance characteristics of Submersible Pump
12. Determination of performance characteristics of Reciprocating Pump

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Laboratory Manual:

[1] *Fluid Mechanics Laboratory Manual*, Department of CE, KITSW.

Reference Books:

[1] N. Kumara Swamy, *Fluid Mechanics and Machinery Laboratory Manual,* Charotar Publishing House Pvt., Ltd., 2008.

[2] Sarbjit Singh, *Experiments in Fluid Mechanics*, New Delhi: PHI Learning Private Limited, 2009.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: determine the hydraulic coefficient for various flow measuring devices

CO2: apply Bernoulli's equation in estimating head loss in pipes

CO3: apply the principles of impact of jet on different vanes

CO4: demonstrate the characteristics of hydraulic machines

Course Articulation Matrix: U18OE411B FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE411B.1	2	1	-	1	-	-	-	-	1	-	-	1	1	-
CO2	U18OE411B.2	2	1	-	1	-	-	-	-	1	-	-	1	1	-
CO3	U18OE411B.3	2	1	-	1	-	-	-	-	1	-	-	1	1	-
CO4	U18OE411B.4	2	1	-	1	-	-	-	-	1	1	-	1	1	-
U18OE411B.1		**2**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**1**	**-**

U18OE411C MECHATRONICS LAB

Class: B. Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in /on …

LO1 : basic elements underlying mechatronic systems: analog electronics, digital electronics, sensors, transducers, actuators, microcontrollers and embedded software

LO2 : interface of various systems to a PLC

LO3 : integration of various systems through programming

LO4 : design and simulation of hydraulic and pneumatic circuits

LIST OF EXPERIMENTS

1. Controlling A.C. Non servomotor clockwise and anti clockwise with time delay
2. Controlling A.C. Non servo motor using digital inputs proximity sensors
3. Controlling of Single acting Pneumatic Cylinder with time delay
4. Controlling of double acting Pneumatic Cylinder with time delay and sequencing
5. Control of D.C servomotor (rotating table clockwise and counterclockwise)
6. Integration of AC Non servo motors, single acting pneumatic cylinder and double acting pneumatic cylinder
7. Integration of AC Non- servomotor and pneumatic cylinders with digital inputs
8. Controlling of X table and Y table
9. Controlling of various systems using manual input
10. Controlling of traffic lights with time delay
11. Controlling of lift operations with time delay
12. Hydraulic and Pneumatic simulation

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Laboratory Manual:

[1] *Mechatronics Lab Manual*, Department of ME, KITSW

Reference Books:

[1] *ATS Manual of L.S. Mechatronics*,2000.

[2] Bolton W., *Mechatronics*, 5th ed., New Delhi: Pearson Publications, ISBN-13: 978-0273742869,2011.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: develop PLC program to control AC non servomotors, single acting and double acting pneumatic cylinders with different operation conditions

CO2: develop PLC program to control various systems

CO3: integrate various mechanical and electrical systems and operate them

CO4: design and simulate the hydraulic and pneumatic circuits

Course Articulation Matrix: U18OE411C MECHATRONICS LAB

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE411C.1	1	2	1	2	-	-	-	-	-	1	-	1	1	-
CO2	U18OE411C.2	1	2	1	2	2	-	-	-	-	1	-	1	1	-
CO3	U18OE411C.3	1	2	1	2	2	-	-	-	-	1	-	1	1	-
CO4	U18OE411C.4	1	2	1	2	2	-	-	-	-	1	-	1	1	-
U18OE411C		1	2	1	2	2	-	-	-	-	1	-	1	1	-

U18OE411D WEB PROGRAMMINGLABORATORY

Class: B. Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in /on …

LO1 : implementing HTML Tags, CSS and Java Scripts for creating static web pages

LO2 : usage of JSP in designing dynamic web pages

LO3 : usage of PHP in designing a web base application

LO4 : accessing different web data servers using JSP and PHP

LIST OF EXPERIMENTS

Experiment-1

1. Design the following static web pages with the following attributes:
   a. Basic Tags.
   b. Heading Tags.
   c. List (Ordered and Un-Ordered).
   d. Textbox, Buttons.

Experiment-2

2. **HTML**

AIM: Design the following static web pages required for an online book store web site.

a. **HOMEPAGE:**
b. **LOGINPAGE**
c. **CATALOGEPAGE**

DESCRIPTION:

a. HOMEPAGE

The static home page must contain three **frames**.

- ***Top frame*:** Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).
- ***Left frame*:** At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link **CSE** the catalogue for **CSE** Books should be displayed in the Right frame.
- ***Right frame*:** The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the website.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart

CSE ECE EEE CIVIL	Description of the Web Site

b. LOGIN PAGE: This page looks like below:

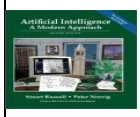
Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Login : Password: **Submit** **Reset**			

Experiment-3

c. CATOLOGUEPAGE:

The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following:

- Snap shot of Cover Page.
- Author Name and Publisher.
- Price and Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE		Book : XML Bible Author : Winston Publication : Wiley	$ 40.5	Add to cart
ECE		Book : AI Author :S.Russel Publication : Princeton hall	$ 63	Add to cart
EEE		Book : Java 2 Author : Watson Publication : BPB publications	$ 35.5	Add to cart
CIVIL		Book : HTML in 24 hours Author : Sam Peter Publication : Sam publication	$ 50	Add to cart

Experiment-4

3. VALIDATION

AIM: To do validation for registration page using JavaScript.

DESCRIPTION: Write *JavaScript* to validate the following fields of the above registration page.

a. Name (Name should contains alphabets and the length should not be less than 6 characters).

b. Password (Password should not be less than 6 characters length).

c. E-mail id (should not contain any invalid and must follow the standard pattern ***(****name@domain.com****)***

d. Phone number (Phone number should contain 10 digits only). Note: You can also validate the login page with these parameters.

4. CSS

AIM: Write a program illustrating various methods in cascading style sheets.

a. Use different font, styles and set a background image

b. Control the repetition of the image

c. Define styles for links

d. Work with layers and add a customized cursor

DESCRIPTION: Design a web page using **CSS (C**ascading **S**tyle **S**heets**)** which includes the following:

a. Use different font, styles: In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.

b. Set a background image for both the page and single elements on the page. You can define the background image for the page like this:

c. Control the repetition of the image with the background-repeat property. As background-repeat: repeat

d. Define styles for links

e. Work with layers:

f. Add a customized cursor:

Selector {cursor: value}

.xlink {cursor: crosshair}

.hlink{cursor: help}

5. Embedding JavaScript in HTML pages.

6. Design a registration form and validate its field by using JavaScript.

Experiment-5

7. To design the scientific calculator and make event for each button using JavaScript.
8. WAP to create popup boxes in JavaScript.
9. Program to create a class calculator that contains an overloaded method called add to calculate the sum of two integers, two float numbers and, one integer and one float.

Experiment-6

10. Print current date &time
11. JSP Program to auto refresh a page
12. JSP Program to count no. of visitors on website
13. JSP program for error handling
14. Demonstrate expression tag
15. Detect locale, language settings & local specific time
16. Demonstrate JSP implicit object
17. JSP Program to display given number in words

Experiment-7

18. Display the contents of Employee table in a neat format.
19. Insert ***N***, no. of records into Employee table using ***Prepared Statement.***
20. Enhance the salaries of Employee by 10% who are earning salary greater than 5000using ***Callable Statement.***
21. Delete all students whose marks are below 50% and also display the count.

Experiment-8

22. Write a HTML file to create a simple form with 5 input fields ***(Name, Password, Email, Pin code, Phone No. and a Submit button)*** and demonstrate required field validations to validate that all input fields are required and display error messages if the above validations do not hold.
23. Create a JSP Page with and run in JSP Engines.
24. Demonstrate Session Tracking in JSP.
25. JSP Program to validate username and password

Experiment-9

26. Create Database Connectivity with JSP page with different JDBC Drivers.
27. JSP Program to Select record from database
28. JSP Program to Insert a record into the database
29. Create a CRUD operation for JSP Page using MySQL
30. JSP Program to upload file into server

Experiment-10

31. Create a form for your college library entering student details for each student in the college. Validate the form using PHP valuators and display error messages.

32. Write a PHP which does the following job:
Insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the User Name and Password from the database (instead of cookies).

Experiment-11

33. Create tables in the database which contain the details of items (books in our case like Book name, Price, Quantity, Amount) of each category. Modify your catalogue page in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using PHP.

34. Create and delete MYSQL database using PHP.

Experiment-12

35. Create a PHP program to demonstrate opening and closing a file.

36. Create a PHP program to demonstrate reading a file and writing in a file.

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Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: create the static web pages using HTML Tags and CSS and JavaScripts
CO2: design dynamic web page for web applications using JSP
CO3: develop server side scripts for web base applications using PHP
CO4: design web applications for effective storage and retrieval of data in MySQL using PHP

Course Articulation Matrix: U18OE411D WEB PROGRAMMING LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE411D.1	2	2	2	1	2	1	-	1	2	1	2	1	1	-
CO2	U18OE411D.2	2	2	2	1	2	1	-	1	2	1	2	1	1	-
CO3	U18OE411D.3	2	2	2	1	2	1	-	1	2	1	2	1	1	-
CO4	U18OE411D.4	2	2	2	1	2	1	1	1	2	1	2	1	1	-
U18OE411D		2	2	2	1	2	1	1	1	2	1	2	1	1	**-**

U18OE411F STRENGTH OF MATERIALSLABORATORY

Class: B. Tech.IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in /on …

LO1 : testing of civil engineering materials

LO2 : mechanical properties of civil engineering materials

LO3 : behavior of civil engineering materials when tested

LO4 : codal specifications of various engineering materials

LIST OF EXPERIMENTS

1. Determination of Stress–Strain characteristics of (a) Mild steel and (b) TOR steel
2. Determination of the compressive strength of wood and punching shear strength
3. Determination of the Brinell's hardness numbers for steel, brass and aluminum
4. Determination of the modulus of rigidity by conducting torsion test on solid shaft or hollow shaft
5. Determination of the modulus of rigidity by conducting compression test on spring
6. Determination of the Young's modulus of the given material by conducting flexural test on simply supported beam
7. Determination of the Young's modulus of the given material by conducting flexural test on continuous beam
8. Determination of the Young's modulus of the given material by measuring conducting flexural test on propped cantilever beam
9. Bend and rebend test on steel specimen
10. Shear test for Mild steel specimen
11. Impact test on Metal Specimens using Izod test
12. Impact test on Metal Specimens using Charpy test
13. Demonstration of measuring strains using strain gauges, LVDTs

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Laboratory Manual:

[1] *Strength of Materials Laboratory Manual*, Department of CE, KITSW

Reference Books:

[1] Harmer E. Davis and George Earl Troxell, *Testing and Inspection of Engineering Materials*, 2nd ed., New

Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 1955.

[2] A.V.K. Suryanarayana, *Testing of Metallic Materials*, 2nd ed., New Delhi: PHI Learning Pvt. Ltd.,2007.

[3] IS 1786:2008 High strength deformed steel bars and wires for concrete reinforcement-specification. Bureau of Indian standards, New Delhi,2008.

[4] IS 432(Part-I):1982 Specification for mild steel and medium tensile steel bars and Hard drawn steel wires for concrete reinforcement. Bureau of Indian standards, New Delhi,1992.

[5] IS 432(Part-II):1982 Specification for mild steel and medium tensile steel bars and Hard drawn steel wires for concrete reinforcement. Bureau of Indian standards, New Delhi,2004.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: correlate theory with the testing of engineering materials for quality assessment

CO2: evaluate the mechanical properties of civil engineering materials

CO3: appraise the behavior of civil engineering materials when tested under loads

CO4: realize the specifications recommended by codes to civil engineering materials

Course Articulation Matrix: U18OE411F STRENGTH OF MATERIALS LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE411F.1	1	-	-	1	-	1	-	-	2	1	1	1	1	-
CO2	U18OE411F.2	1	-	-	1	-	1	-	-	2	-	-	1	1	-
CO3	U18OE411F.3	1	-	-	1	-	1	-	-	2	-	-	1	1	-
CO4	U18OE411F.4	1	-	-	1	-	1	-	2	1	1	1	1	1	-
U18OE411F		**1**	**-**	**-**	**1**	**-**	**1**	**-**	**2**	**1.75**	**1**	**1**	**1**	**1**	**-**

U18CH416 ENVIRONMENTALSTUDIES

Class: B. Tech.IV-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
2	-	-	-

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on …

LO1 : necessity to use natural resources more equitably

LO2 : concepts of ecosystem and the importance of biodiversity conservation

LO3 : causes, effects and control measures of various environmental issues

LO4 : issues involved in enforcement of environmental legislation

UNIT-I (6)

Introduction - The multidisciplinary nature of environmental studies - definition, scope and importance. **Natural Resources: Forest Resources -** Use and over–exploitation of forests, deforestation, timber extraction, mining, dams - their effects on forests and tribal people, **Water Resources -** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, **Mineral Resources -** Environmental effects of extracting and using mineral resources, **Agricultural Land -** Land as a resource, landdegradation,soilerosionanddesertification,**FoodResources**-Worldfoodproblems, effects of modern agriculture, fertilizer-pesticide problems, water logging and salinity, **Energy Resources -** Renewable and non-renewable energy sources, use of alternate energy sources

UNIT-II (6)

Ecosystem and Biodiversity: Ecosystem - Concepts of an ecosystem, food chain, food webs, ecological pyramids, energy flow in the ecosystem and ecological succession

Biodiversity and its Conservation – Introduction, definition, genetic, species and ecosystem diversity, value of biodiversity, biodiversity in India, hot spots of biodiversity, man-wildlife conflicts, endangered and endemic species of India, in-situ and ex-situ conservation

UNIT-III (6)

Environmental Pollution: Global climatic change, green house gases, effects of global warming, ozone layer depletion, International conventions/protocols - Earth summit, Kyoto protocol and Montreal protocol, causes and effects of air, water, soil, marine and noise pollution with case studies, solid and hazardous waste management, effects of urban industrial and nuclear waste, natural disaster management- flood, earthquake, cyclone and landslides

UNIT-IV (6)

Social Issues and the Environment: **Role of Individual and Society** - Role of individual in prevention of pollution, water conservation, Rain water harvesting and watershed management, **Environmental Protection / Control Acts** - Air (Prevention and control of Pollution) Act- 1981, water (Prevention and Control of Pollution) Act-1974, water Pollution Cess Act-1977, Forest conservation Act (1980 and 1992),

wildlife Protection Act 1972 and environment protection Act 1986, issues involved in enforcement of environmental legislations, **Human Population and Environment** - Population growth, family welfare programmes, women and child welfare programmes, role of information technology in environment and human health

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Textbooks:

[1] Erach Bharucha, *Text Book of Environmental Studies for Under Graduate Courses*, 2nd ed., Universities Press (India) Private Limited,2013.

Reference Books:

[1] Y. Anjaneyulu, *Introduction to Environmental Science*, New Delhi: B.S. Publications,2004.

[2] Gilbert M. Masters, *Introduction to Environmental Engineering & Science*, 3rd ed., New Delhi: PHI Learning Pvt. Ltd., 1991.

[3] Anubha Kaushik, C.P. Kaushik, *Environmental Studies*, 4th ed., New Delhi: New Age International Publishers,2014.

[4] R.Rajagopalan, *Environmental Studies from crisis to cure*, 2nd ed., Oxford: Oxford University Press, 2011.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: investigate any environmental issue using an interdisciplinary framework

CO2: formulate an action plan for sustainable alternatives and conserving biodiversity that integrates science, humanist, social and economic perspective

CO3: identify and explain the complexity of issues and processes which contribute to an environmental problem

CO4: participate effectively in analysis and problem-solving through knowledge in environmental legislations

Course Articulation Matrix: U18CH416 ENVIRONMENTAL STUDIES

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18CH416.1	2	1	2	1	-	2	1	-	1	-	-	-	-	1
CO2	U18CH416.2	-	-	2	-	-	1	2	-	1	-	-	-	-	1
CO3	U18CH416.3	1	2	1	-	-	1	2	1	1	-	-	-	-	1
CO4	U18CH416.4	-	-	1	-	-	1	2	-	1	-	-	-	-	1
U18CH416		1.5	1.5	1.5	1	-	1.25	1.75	1	1	-	-	-	-	1

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15

(An Autonomous Institute under Kakatiya University, Warangal)

SCHEME OF INSTRUCTIONS & EVALUATION

V-SEMESTER OF 4-YEAR B.TECH. DEGREE PROGRAMME

(5Th+3P+1MC+1Seminar)

Sl.No	Course Category	Course Code	Course Name	Periods/week			Credits	Evaluation Scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	MC	U18MH501	Universal Human Values - II	2	-	-	-	10	30	40	60	100
2	PE	U18PE502	Professional Elective - I / MOOC-I	3	-	-	3	10	30	40	60	100
3	PCC	U18EE503	Power Systems-II	3	-	-	3	10	30	40	60	100
4	PCC	U18EE504	Electrical Machines-II	3	-	-	3	10	30	40	60	100
5	PCC	U18EE506	Power Electronics	3	-	-	3	10	30	40	60	100
6	PCC	U18EC511	Microprocessors and Microcontroller Systems	3	-	-	3	10	30	40	60	100
7	PCC	U18EE508	Electrical Machines Laboratory-II	-	-	2	1	40	-	40	60	100
8	PCC	U18EE509	Power Electronics Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18EC512	Microprocessors and Microcontroller Systems Laboratory	-	-	2	1	40	-	40	60	100
10	PROJ	U18EE510	Seminar	-	-	2	1	100	-	100	-	100
			Total	**17**	**-**	**8**	**19**	**280**	**180**	**460**	**540**	**1000**
Additional Learning*:			*Maximum credits allowed for Honours/Minor*	-	-	-	*7*	-	-	-	-	-
			Total credits for Honours/Minor students:	**-**	**-**	**-**	***19+7***	**-**	**-**	**-**	**-**	**-**

** List of courses for additional learning through **MOOCs** towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

Note: L - Lectures; T – Tutorials; P – Practicals; CIE – Continuous Internal Evaluation; TA – Teachers Assessment; MSE – Mid Semester Examination; ESE – End Semester Examination;

Student Contact Hours/Week : 25

Total Credits(C) : 19

Professional Elective-I /MOOC - I

U18EE502A: Renewable Energy Systems

U18EE502B: Electrical Engineering Materials

U18EE502C: Communication Engineering

U18MH501 / U18MH601 UNIVERSAL HUMAN VALUES – II

Class: B. Tech. V-Semester
B. Tech.VI-Semester

Branch: CE, EIE, EEE, ECE & ECI
ME, CSE, IT & CSN

Teaching Scheme:

L	T	P	C
2	-	-	-

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

* Pre-requisite: U18MH111 Universal Human Values - I (*Induction Programme)*

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: self-exploration, happiness and prosperity as the process of value education
LO2: harmony in the human being - self & family
LO3: co-existence of human being with society & nature
LO4: professional ethics, commitment and courage to act

UNIT – I (6 + 3)

Introduction - Need, Basic Guidelines, Content and Process for Value Education: Purpose and motivation for the course, Recapitulation from Universal Human Values - I(*Induction programme*)

Self-Exploration: Its content and process, Natural acceptance and experiential validation – As the process for self-exploration

Continuous Happiness and Prosperity: A look at basic human aspirations, Right understanding, Relationship and physical facility - The basic requirement for fulfillment of aspirations of every human being with their correct priority

Understanding Happiness and Prosperity correctly: A critical appraisal of the current scenario, Method to fulfill the above human aspirations - Understanding and living in harmony at various levels

UNIT – II (6 + 3)

Understanding Harmony in the Human Being- Harmony in Myself & Family:

Harmony in Myself: Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Happiness and physical facility; Understanding the 'Body' as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of 'I' with the 'Body' - Sanyam and Health; Correct appraisal of physical needs, Meaning of prosperity in detail, Programs to ensure Sanyam and Health

Harmony in Family: Understanding values in human - Human relationship; Meaning of justice (Nine universal values in relationships), Program for its fulfillment to ensure mutual happiness, Trust and respect as the foundational values of relationship, Understanding the meaning of trust, Difference between intention and competence; Understanding the meaning of respect, Difference between respect and differentiation, The other salient values in relationship

UNIT – III (6 + 3)

Understanding Harmony with Society, Nature & Existence:

Understanding the Harmony in the Society (society being an extension of family): Resolution, Prosperity, Fearlessness (trust) and Co-existence as comprehensive human goals, Visualizing a universal harmonious order in society – Undivided society; Universal order - From family to world family

Understanding the Harmony in the Nature: Interconnectedness and mutual fulfillment among the four orders of nature - Recyclability and self-regulation in nature

Whole Existence as Co-existence: Understanding existence as co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence

UNIT – IV (6 + 3)

Implications of Holistic Understanding of Harmony on Professional Ethics:

Natural acceptance of human values, Definitiveness of ethical human conduct, Basis for Humanistic education, Humanistic constitution and Humanistic universal order

Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order b) Ability to identify the scope and characteristics of people friendly and eco-friendly production systems and c) Ability to identify and develop appropriate technologies and management patterns for above production systems

Case studies: Case studies of typical holistic technologies, Management models and production systems, Strategy for transition from the present state to Universal human order **–** a) At the level of individual: As socially and ecologically responsible engineers, technologists and managers b) At the level of society: As mutually enriching institutions and organizations

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Text Book:

[1] R .R. Gaur, R. Sangal and G. P. Bagaria, *Human Values and Professional Ethics*, New Delhi: Excel Books, 2010.

Reference Books:

[1] A. Nagaraj, *JeevanVidya: EkParichaya*, Raipur: Jeevan Vidya Prakashan, Amarkantak, 2018.
[2] A.N. Tripathi, *Human Values*, 3rd ed. New Delhi: New Age International Publisher, 2019.
[3] M. Govindrajran, S. Natrajan& V.S. Senthil Kumar, *Engineering Ethics (includes Human Values)*, 12th ed., Haryana: PHI Learning Pvt. Ltd., 2011.
[4] Jayshree Suresh, B. S. Raghavan, *Human Values & Professional Ethics*, 4th ed. New Delhi: S. Chand & Co. Ltd., 2012.

Additional Resources:

[1] R.R Gaur, R Sangal, G P Bagaria, *A foundation course in Human Values and professional Ethics (Teacher's Manual)*, New Delhi: Excel books, 2010.
[2] A set of DVDs containing - Video of Teachers' Orientation Program - PPTs of Lectures and Practice Sessions (*Audio-visual material for use in the practice sessions*)

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.
Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: *interpret the importance of continuous happiness & prosperity through self-exploration and imbibe skills to examine harmony*
CO2: *appraise the concept of sentience, distinguish between intention & competence and prioritize human values in relationships*
CO3: build fearlessness & co-existence as comprehensive human goal and agree upon interconnectedness & mutual fulfillment
CO4: assess the understanding of harmony, adapt professional ethics and take part in augmenting universal human order

Course Articulation Matrix (CAM): U18MH501 / U18MH601 UNIVERSAL HUMAN VALUES - II

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18MH501.1/ U18MH601.1	-	-	-	-	-	1	-	2	1	1	-	2	-	-
CO2	U18MH501.2/ U18MH601.2	-	-	-	-	-	1	-	2	1	1	-	2	-	-
CO3	U18MH501.3/ U18MH601.3	-	-	-	-	-	1	-	2	1	1	-	2	-	-
CO4	U18MH501.4/ U18MH601.4	-	-	-	-	-	1	-	2	1	1	-	2	-	-
U18MH501/ U18MH601		-	**-**	-	**-**	-	**1**	**-**	**2**	**1**	**1**	**-**	**2**	-	-

U18EE502A RENEWABLE ENERGY SYSTEMS

Class: B. Tech.V-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on …

LO1: types of renewable energy sources and principle of solar energy systems
LO2: principle of wind energy and geothermal energy systems
LO3: harnessing electrical energy from oceans and biomass
LO4: working of fuel cells and types of energy storage systems

UNIT-I (9)

Introduction: Conventional and non-conventional sources of energy – brief description of different renewable energy sources

Solar energy: Introduction to prospects of solar PV systems: photovoltaic effect and electrical equivalent circuit of a PV cell, dependence of a PV cell characteristic on temperature, solar cell output characteristics, solar maximum power point tracking (MPPT) using Perturb &Observe algorithm, applications of solar PV systems- street lighting, domestic lighting, solar PV pumping systems

UNIT-II (9)

Wind energy: Principles of wind power, evaluation of wind intensity, operation of a wind turbine and wind power curve, different types of wind turbine generators, topography and classification of wind turbines and its applications

Geothermal Energy: Origin and types of geothermal energy, operational difficulties, liquid dominated systems

UNIT-III (9)

Energy from Oceans: Ocean temperature differences, ocean waves, energy from the waves, introduction of tidal power, basic principle of tidal power, components of tidal power plants

Bioenergy: Introduction, bio-mass conversion technologies, photo synthesis, biogas generation, biogas from power plant wastes, methods of maintaining biogas production, utilization of biogas, biogas gasification

UNIT-IV (9)

Chemical energy sources: Introduction to fuel cells, principle of operation of fuel cell, classification of fuel cells, advantages, disadvantages and applications of fuel cells

Types of energy storage systems: Introduction, mechanical energy storage systems, batteries, ultra-capacitors, super conducting magnetic storage, applications

Case study on present scenario of energy generation

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Textbook:

[1] Rai G.D, *Non-Conventional Energy Sources*, 4th ed. New Delhi: Khanna Publishers, 2010.

Reference Books:

[1] B.H. Khan, *Non-conventional Energy Resources*, 2nd ed. New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2006.

[2] Felix A. Farret, M. Godoy Simoes, *Integration of Alternative Sources of Energy*, New Jersey: John Wiley & Sons, 2006.

[3] Bansal N. K,Kaleeman, M.Miller, *Renewable Energy Sources and Conversion Technology*, New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2006.

[4] Duffie and Beckman, *Solar Energy Thermal Process*, New Jersey: John Wiley & Sons, 2006.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: evaluate the sources of renewable and conventional energy resources, quantify solar power and judge the applicability of solar energy

CO2: analyze the wind power developed by a wind energy system and the operational difficulties associated with geothermal energy

CO3: analyze the feasibility of harnessing of electric power from oceans and biomass

CO4: select an appropriate energy storage system for a given application and summarize the operating principle of fuel cell

Course Articulation Matrix: U18EE502A RENEWABLE ENERGY SYSTEMS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE502A.1	2	2	-	-	1	1	1	-	-	-	-	1	2	2
CO2	U18EE502A.2	2	2	-	-	1	-	1	-	-	-	-	1	2	2
CO3	U18EE502A.3	2	1	-	-	-	-	1	-	-	-	-	1	1	1
CO4	U18EE502A.4	2	-	-	-	-	-	1	-	-	-	1	1	2	1
U18EE502A		**2**	**1.67**	**-**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**1**	**1**	**1.75**	**1.5**

U18EE502B ELECTRICAL ENGINEERING MATERIALS

Class: B. Tech. V-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: properties of conducting & semiconducting materials and their applications
LO2: classification of insulating & dielectric materials and their application in HV systems
LO3: properties of magnetic materials & nanocomposite materials and their applications
LO4: materials employed for electric and electronic applications

UNIT – I(9)

Conducting materials: Introduction, resistivity and factors affecting resistivity, classification of conducting materials into low-resistivity and high resistivity materials, applications of low and high resistivity materials and their alloys, superconducting materials

Semiconducting materials: Introduction, energy band theory, intrinsic and extrinsic semiconducting materials, factors affecting electrical conduction in semiconducting materials, photoconductivity, applications of semiconducting materials

UNIT – II (9)

Insulating materials: Introduction, general properties, classification, solid insulating materials, insulating liquids, insulating gasses, applications

Dielectric materials: Introduction, classification, electrical properties - volume and surface resistivity, dielectric loss, dielectric strength, dielectric constant, polarization, breakdown in dielectric materials, applications of dielectrics in high voltage power equipment

UNIT – III (9)

Magnetic materials: Introduction, classification, magnetization curve, hysteresis and eddy current losses, Curie point, magnetostriction, soft and hard magnetic materials, applications

Nanomaterials: Origin of nanotechnology, classification, properties and applications of nanomaterials in electrical engineering

UNIT – IV (9)

Materials for special purposes: Introduction, structural materials, protective materials, bimetallic strips, soldering materials, electric carbon materials, thermocouple, lighting systems (LCD, LED, CFL)

Materials for electronic components: Materials used for resistors, capacitors, inductors, transformers

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Textbook:

[1]. K.B. Raina, S.K. Bhattacharya, T. Joneja, *Electrical Engineering Materials and Electrical Components*, New Delhi: S.K. Kataria & Sons, Reprint: 2013.

Reference Books:

[1]. A. J. Dekker, *Electrical Engineering Materials,* New Delhi: Prentice Hall of India, 1988.

[2]. R.K. Shukla, Archana Singh, *Electrical Engineering Materials,* New Delhi: Tata Mcgraw Hill Education Pvt. Ltd., 2012.

[3]. Charles P. Poole Jr., Frank J. Owens, *Introduction to Nanotechnology*, New Jersey: John Wiley & Sons, 2003.

[4]. S.K. Bhattacharya, *Electrical and Electronic Engineering Materials& Components*, New Delhi: Khanna Publishers, 1996.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: Select the required conducting & semiconducting materials based on the application

CO2: classify the insulating & dielectric materials and identify materials for electrical insulation in HV systems

CO3: identify suitable magnetic materials for a given application and summarize the properties of nanomaterials

CO4: identify the passive components for electrical & electronic applications

Course Articulation Matrix: U18EE502B ELECTRICAL ENGINEERING MATERIALS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE502B.1	2	1	-	-	-	-	1	-	-	-	-	1	2	1
CO2	U18EE502B.2	2	-	-	-	-	-	1	-	-	-	-	1	2	1
CO3	U18EE502B.3	2	-	-	-	-	1	1	-	-	-	-	1	2	1
CO4	U18EE502B.4	2	-	-	-	-	1	1	-	-	-	-	1	2	1
U18EE502B		**2**	**1**	**-**	**-**	-	1	1	-	-	-	-	1	**2**	**1**

U18EE502C COMMUNICATION ENGINEERING

Class: B. Tech. V-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: amplitude modulation techniques and their time domain & frequency domain representations
LO2: angle modulation techniques and their time domain and frequency domain representations
LO3: pulse code modulation techniques
LO4: bandpass data transmission system

UNIT – I (9)

Introduction: Communication system, need for modulation, radio frequency spectrum, classification of modulation techniques

Amplitude Modulation: Time and frequency domain description of amplitude modulation (AM), Generation and demodulation of AM, DSB-SC-generation and demodulation- coherent demodulation - envelop detection - carrier recovery, SSB-SC, VSB and their generation and demodulation, Frequency Division Multiplexing, AM transmitters – High level and low level AM transmitters

UNIT – II (9)

Angle Modulation: Instantaneous frequency - Phase and Frequency Modulation - Single tone FM and its spectral analysis, Direct and indirect (Armstrong's) methods of FM generation, FM demodulation: balanced slope detector - phase discriminator, FM transmitters

Pulse modulation: Sampling theorem for band limited signals, types of pulse modulation-PAM, PWM, PPM

UNIT – III (9)

Digital Modulation: Introduction, elements of digital communication system, source coding systems-introduction, Discrete Memoryless Source (DMS), measure of information, entropy, information rate, source coding- Shannon Fano, Huffman coding, Shannon Hartley Law

Pulse-Code Modulation (PCM), Quantization, quantization error, signal to quantization noise ratio, Delta modulation (DM), Adaptive Delta Modulation (ADM), comparison of PCM and DM

UNIT – IV (9)

Bandpass Data Transmission: Bandpass data transmission system, generation, detection and constellation diagrams of coherent Binary Amplitude Shift Keying (BASK), Coherent Binary Phase Shift Keying (BPSK), Coherent Binary Frequency Shift Keying (BFSK), Quadrature Phase Shift Keying (QPSK)

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Textbooks:

[1]. Simon Haykin, *Communication Systems*, 4th ed., New Jersey: John Wiley & Sons, 2001 *(Unit 1 to 3).*
[2]. K.Sam Shanmugam, *Digital and Analog Communications*, 1st ed., New Delhi: Wiley India Pvt. Ltd., 2012 *(Unit 4).*

Reference Books:

[1]. A. Bruce Carlson, *Communication Systems*, New York: McGraw Hill companies Inc., 1988.
[2]. H. Taub, D. L. Schilling, *Principles of Communications*, 3rd ed., New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2007.
[3]. R.P. Singh and S.D. Sapre, *Communication System*, 2nd ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2008.
[4]. K. Vasudevan, *Digital Communications and Signal Processing,* 2nd ed., New Delhi: Universities Press (India) Pvt. Ltd., 2018.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.
Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.
Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: elaborate different AM modulation and demodulation techniques
CO2: discuss angle modulation and demodulation techniques
CO3: evaluate the codes using Shannon Fano, Huffman and pulse code modulation techniques
CO4: measure the performance of bandpass data transmission systems

Course Articulation Matrix: U18EE502C COMMUNICATION ENGINEERING

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE502C.1	2	2	1	2	-	-	-	-	-	-	-	2	1	1
CO2	U18EE502C.2	2	2	1	2	-	-	-	-	-	-	-	2	1	1
CO3	U18EE502C.3	2	2	1	2	-	-	-	-	-	-	-	2	1	-
CO4	U18EE502C.4	2	2	1	2	-	-	-	-	-	-	-	2	1	-
U18EE502C		**2**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**1**	**1**

U18EE503 POWER SYSTEMS-II

Class: B. Tech. V-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: representation of transmission lines and their performance
LO2: methods of voltage control in transmission lines and per unit representation of power system components
LO3: symmetrical components and power system fault calculations
LO4: travelling waves on transmission lines and system neutral grounding

UNIT – I (9)

Performance of transmission line: Representation of transmission lines, short transmission lines, medium length lines, Nominal T and ∏ representation, long transmission lines

General network constants (A, B, C, D constants): Cascaded &parallel networks, skin effect, proximity effect and Ferranti effect, surge impedance loading, power flow through transmission lines

UNIT – II (9)

Voltage control: Introduction, methods of voltage control, shunt, series compensation, tap changing transformers, booster transformers, synchronous phase modifiers

Per unit representation of Power systems: Single line diagram, impedance and reactance diagrams, per unit quantities, advantages of per unit systems

UNIT – III (9)

Symmetrical components: Significance of positive, negative, zero sequence components, average 3-phase power in terms of symmetrical components

Symmetrical & Unsymmetrical fault analysis: Sequence impedances and sequence networks for fault calculations, single line to ground (LG) fault, LL fault, LLG fault, LLL fault (without fault impedance), reactors and their location, short circuit capacity of a bus

UNIT – IV (9)

Traveling waves on transmission line: Production of travelling waves, open circuited line, short circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction coefficients at a T-junction, line terminated through a capacitance, attenuators of travelling waves

System neutral grounding: Introduction, ungrounded neutral system, arcing grounds, advantages of neutral grounding, methods of neutral grounding solid grounding, reactance grounding, Peterson coil grounding, grounding transformer, choice of grounding

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Textbook:

[1]. C.L. Wadhwa, *Electrical Power Systems*, 6th ed., New Delhi: New Age International Pvt. Ltd., 2014.

Reference Books:

[1]. Olle I Elgerd, *Electric Energy Systems Theory*, New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2011.

[2]. Stevenson W.D., *Elements of Power System Analysis*, 4th ed., New York: McGraw Hill International Publishers, 2014.

[3]. I.J. Nagarath & D.P. Kothari, *Modern power system Analysis*, 4th ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2012.

[4]. J. Grainger & W.D. Stevenson, *Power System Analysis*, New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2003.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: analyze the efficiency & voltage regulation of transmission lines

CO2: evaluate different types of voltage control and compute per unit values in a power system

CO3: determine the fault currents for symmetrical and unsymmetrical faults

CO4: analyze the concept of traveling waves on transmission line and specify types of system neutral grounding

Course Articulation Matrix: U18EE503 POWER SYSTEMS-II

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE503.1	2	2	-	-	-	1	-	-	-	-	-	1	2	1
CO2	U18EE503.2	2	2	-	-	-	1	-	-	-	-	-	1	2	1
CO3	U18EE503.3	2	2	-	1	-	1	-	-	-	-	-	1	2	1
CO4	U18EE503.4	2	2	-	-	-	1	-	-	-	-	-	1	2	1
U18EE503		2	2	**-**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**

U18EE504 ELECTRICAL MACHINES - II

Class: B. Tech. V-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: construction, working principle, equivalent circuit, performance characteristics, starting methods and speed control of 3-phase induction motors
LO2: construction, working principle, equivalent circuit and applications of 1-phase motors
LO3: construction, working principle and performance characteristics 3-phase synchronous generators
LO4: construction, working principle, performance and applications of 3-phase synchronous motors

UNIT – I (9)

3-phase induction motors: Construction details, types, production of rotating magnetic field principle of operation, equivalent circuit, phasor diagram, torque equation, slip torque characteristics, effects & change in supply voltage and frequency on torque and speed, losses and efficiency, determination of equivalent circuit parameters by no load and blocked rotor tests, double cage induction motor, applications

AC starters: Direct online (DOL), Star- Delta (γ-Δ), Autotransformer, Rotor resistance starters

Methods of speed control: Pole changing, variable frequency variable voltage, rotor resistance, rotor injected emf technique

UNIT – II (9)

1-phase induction motors: Principle & operation, double field revolving theory, methods of starting- split phase, capacitor run, capacitor start and run, shaded pole induction motors, equivalent circuit, determination of equivalent circuit parameters by conducting no-load & blocked rotor tests, applications

Universal motor: Constructional features, working principle, characteristics and applications

UNIT – III (9)

3-phase synchronous generators: Construction, types, winding factors, production of emf, harmonics armature reaction, synchronous reactance, phasor diagrams, load characteristics, OC & SC tests, methods of predetermination of voltage regulation by synchronous impedance (EMF), MMF and Potier (ZPF) methods, two-reaction theory and phasor diagrams for a salient-pole synchronous machine, slip test, power angle characteristics, synchronization & synchronizing power, parallel operation and load sharing, operation on infinite bus bar, applications

UNIT – IV (9)

3-phase synchronous motors: Principle of operation, phasor diagrams, methods of starting of 3-phase synchronous motors, variation of current and power factor with excitation and mechanical load, hunting and its applications, determination of V- & inverted V-curves, excitation circles and power circles, power factor correction using 3-phase synchronous motors, synchronous condenser, applications

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Textbooks:

[1]. Bimbhra P.S., *Electric Machinery*, 7th ed., New Delhi: Khanna Publishers, 2014*(Chapter 3, 5, 6)*.

[2]. Bimbhra P.S., *Generalized Machine Theory*, 5th ed., New Delhi: Khanna Publishers, 2014*(Chapter 4, 5, 6)*.

Reference Books:

[1]. A. Chakrabarthy, Sudipta Debnath, *Electric Machines*, New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2015.

[2]. A.E. Fitzgerald, Kingsly, Stephen, *Electric Machinery*, New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2015.

[3]. Stephen J. Chapman, *Electric Machinery Fundamentals*, 4th ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2015.

[4]. J.B. Gupta, *Theory& Performance of Electrical Machines*, New Delhi: S.K. Kataria & Sons, 2009.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: determine the performance, evaluate the performance indices and implement speed control of 3-phase induction machines

CO2: determine the equivalent circuit parameters and suggest the starting methods for 1-phase induction motor

CO3: determine the performance and evaluate the performance indices of 3-phase synchronous generators

CO4: describe the operation & performance of 3-phase synchronous motors and apply them for power factor correction

Course Articulation Matrix: U18EE504 ELECTRICAL MACHINES - II

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE504.1	2	2	-	-	-	-	-	-	-	-	-	1	1	1
CO2	U18EE504.2	2	1	-	-	-	1	-	-	-	-	-	1	1	2
CO3	U18EE504.3	2	2	-	-	-	1	-	-	-	-	-	1	1	2
CO4	U18EE504.4	2	1	-	-	-	1	-	-	-	-	-	1	1	1
U18EE504		**2**	**1.5**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1.5**

U18EE506 POWER ELECTRONICS

Class: B. Tech. V-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: power semiconductor devices and triggering methods & protection of SCR
LO2: operation and performance of controlled rectifiers
LO3: forced commutation techniques of SCR and operation & performance of inverters & choppers
LO4: *operation of AC voltage controller &cycloconverter and power electronic applications in industry*

UNIT – I (9)

Characteristics of Power Semiconductor Devices: Introduction of power semiconductor devices like power diode, SCR, GTO, MOSFET, IGBT and their characteristics

Qualitative treatment of DIAC, TRAIC, SiC & GaN devices

Silicon Controlled Rectifier (SCR): Two transistor analogy of SCR, gate triggering circuits, resistance, resistance–capacitance trigger circuits, UJT as relaxation oscillator, Protection of SCR against over voltages, over currents, voltage & current transients

UNIT – II (9)

Phase Controlled Rectifiers: Natural commutation, phase angle control - single phase & three phase - half wave, full wave, half controlled and fully controlled rectifiers - with and without freewheeling diodes for R, R-L and R-L-E loads, distortion factor and power factor calculation, effect of source inductance, Dual converters

UNIT – III (9)

Forced commutation Techniques of SCR

Choppers: Basic circuit, Step-up& Step-down, Classification of choppers on the basis of various quadrants, DC-DC converters without electrical isolation: Buck, Boost, Buck-Boost (Continuous Conduction Mode only)

Inverters: Voltage source inverters and Current source inverters, 1-phase and 3-Phase bridge inverters (180^o, 120^oconduction mode), Brief introduction to sinusoidal pulse width modulation of single-phase & three-phase VSI

UNIT – IV (9)

AC Voltage Controllers: Single Phase AC Controllers with R and RL loads

Single Phase Cycloconverters: Principle and operation of centre tap and bridge type

Applications of Power Electronics Converters: Battery charger, Uninterruptible power supply, Switched mode power supply: forward, flyback and push-pull converters (qualitative treatment only)

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Textbook:

[1]. P.S. Bhimbra, *Power Electronics*, 5th ed., New Delhi: Khanna Publishers, 2013.

Reference Books:

[1]. M.D. Singh & K.B. Kanchandani, *Power Electronics*, 2nd ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2007.

[2]. M.H. Rashid, *Power Electronics, circuits, devices &applications*, 3rd ed., New Delhi: Pearson Ind. Pvt. Ltd., 2004.

[3]. P.C. Sen, *Power Electronics*, New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2013.

[4]. Ned Mohan, Tore M. Undeland, Robbins, *Power Electronics: Converters, Applications, and design*, 3rd ed., New Jersey: John Wiley & Sons, 2007.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: select power semiconductor switching devices for a given application by understanding their characteristics and snubber circuit in SCR based power converters

CO2: analyze the performance of 1-phase, 3-phase controlled rectifiers and dual converters with R, R-L & R-L-E loads

CO3: implement the commutation circuit in SCR based power converters and analyze voltage & current source inverter circuits and buck, boost, buck-boost DC-DC converters

CO4: describe the operating principle of 1-phase AC voltage controllers, 1-Φ to 1-Φ cycloconverters & applications of power electronics converters

Course Articulation Matrix: U18EE506 POWER ELECTRONICS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE506.1	2	2	1	-	-	-	-	-	-	-	-	1	2	1
CO2	U18EE506.2	2	2	-	-	-	1	-	-	-	-	-	1	2	2
CO3	U18EE506.3	2	2	-	-	-	1	-	-	-	-	-	1	2	2
CO4	U18EE506.4	2	2	-	-	-	1	-	-	-	-	-	1	2	1
U18EE506		**2**	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1.5**

U18EC511 MICROPROCESSORS AND MICROCONTROLLER SYSTEMS

Class: B. Tech. V-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: architecture of 8085 microprocessor
LO2: assembly language programming of 8085 microprocessor
LO3: architectural features of 8086 microprocessor
LO4: architecture of 8051 microcontroller and its interfacing

UNIT–I (9)

8085 Microprocessor: Architecture, Registers, Flags, Pin configuration & function of each pin, timing diagrams-machine cycle fetch, Decode & Execute operations, Memory and I/O read and write cycles WAIT state, interrupt timing diagram

UNIT–II (9)

Instruction Set and Programming: Addressing modes of 8085, instruction set, data transfer, arithmetic, logical, rotate, branch and machine control instructions, simple assembly language programs, time delays, concept of stack & instruction related to stack, 8085 interrupts, RST, RIM, SIM instructions, Subroutines and Conditional call instructions

UNIT – III (9)

8086Microprocessor: Organization of 8086 CPU, Architecture, general purpose registers, segment registers, concept of memory segmentation, segment registers, physical and logical addressing, addressing modes, pin diagram, minimum & maximum mode of operation, timing diagrams for I/O operations, procedures and macros

UNIT – IV (9)

8051 Microcontroller: Architecture, instruction set, addressing modes, assembly language programming, timers, input-output ports, interrupts, serial ports, interfacing with LEDs, Switches & Stepper Motor, Real Time Clock (RTC)

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Textbook:

[1]. Ramesh S. Gaonkar, *Microprocessor Architecture, Programming, and Applications with the 8085*, 5th ed.,2000, Penram International, Mumbai. *(Chapter1,2,3,4,5,6,7,8,9)*

[2]. Muhammed Ali Mazidi, *The 8051 Microcontrollers and Embedded systems using Assembly and C*, 2nd ed., 2006, Pearson, New Delhi. *(Chapter 1,2,3,4,5,6,8,9,10,11,12,13)*

Reference Books:

[1]. Kenneth J Ayala, *8086 Microprocessor: Programming & Interfacing with PC*, 1st ed., 2007, Delmar Cengage Learning India, Noida Uttar Pradesh.

[2]. A. K. Ray and K M Burchandi, *Advanced microprocessors and Peripherals*, 3rd edn., 2013, Tata McGraw Hill, Delhi.
[3]. Kennet Ayala, *The 8051 Microcontroller: Architecture, Programming and Applications*, 2nd edn., 1996,Penram Publications, Mumbai.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.
Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.
Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: discuss the architectural features, instruction formats, pin configuration and timing diagrams of 8085 microprocessor
CO2: develop assembly language programs using instruction set of 8085 microprocessorfor data manipulation, writing subroutines, generation of delays
CO3: discuss architecture, memory segmentation & addressing modes of 8086 microprocessor
CO4: develop programs for interfacing I/O devices with 8051microcontroller

Course Articulation Matrix: U18EC511 MICROPROCESSORS AND MICROCONTROLLER SYSTEMS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC511.1	2	-	1	-	-	-	-	-	-	-	-	1	2	-
CO2	U18EC511.2	2	2	1	1	1	-	-	-	-	-	-	1	2	1
CO3	U18EC511.3	2	-	1	1	1	-	-	-	-	-	-	1	2	-
CO4	U18EC511.4	2	2	-	-	1	-	-	-	-	-	-	1	2	1
U18EC511		**2**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**

U18EE508 ELECTRICAL MACHINES-II LABORATORY

Class: B. Tech. V-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in/on

LO1 : performance characteristics and speed control of 3-phase induction motor
LO2 : voltage regulation of 3-phase synchronous generator
LO3 : V- and inverted-V curves of 3-phase synchronous motor
LO4 : equivalent circuit of 1-phase induction motor

LIST OF EXPERIMENTS

1. Determination of equivalent circuit parameters of a 3-phase induction motor by No-load and Blocked rotor tests
2. Brake test on 3-phase induction motor
3. Speed control of 3-phase induction motor by pole changing method
4. Speed control of 3-phaseinduction motor by rotor resistance control method
5. Predetermination of regulation of 3-phase synchronous generator by E.M.F method
6. Predetermination of regulation of 3-phase synchronous generator by M.M.F method
7. Determination regulation of 3-phase synchronous generator by Z.P.F. method
8. Determination regulation on 3-phase synchronous generator by direct loading
9. Determination of X_d and X_q of a Salient Pole 3-phase synchronous machine from slip test
10. Determination of V and inverted V curves of 3-phase synchronous Motors
11. Determination of equivalent circuit parameters of 1-phase induction motor
12. Load test on capacitor start and run 1-phase induction motor

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Laboratory Manual:

[1]. *Electrical Machines- II Laboratory Manual,* Department of EEE, KITSW

Reference Book:

[1]. S.G. Tarnekar, P.K. Kharbanda, *Laboratory Courses in Electrical Engineering,* 4th ed., New Delhi: S. Chand Company Limited, 2003.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: predetermine/ determine the performance of 3-phaseinduction motor and implement methods for speed control

CO2: predetermine/ determine the voltage regulation of 3-phasesynchronous generator using EMF, MMF, ZPF & direct loading methods

CO3: determine the performance of 3-phasesynchronous motor using V- & inverted-V curves

CO4: determine the performance of 1-phase induction motor

Course Articulation Matrix: U18EE508 ELECTRICAL MACHINES-II LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE508.1	2	2	-	-	-	-	-	1	2	2	-	1	2	1
CO2	U18EE508.2	2	2	-	-	-	-	-	1	2	2	-	1	2	2
CO3	U18EE508.3	2	2	-	-	-	-	-	1	2	2	-	1	2	1
CO4	U18EE508.4	2	2	-	-	-	-	-	1	2	2	-	1	2	2
U18EE508		**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**2**	**-**	**1**	**2**	**1.5**

U18EE509 POWER ELECTRONICS LABORATORY

Class: B. Tech. V-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop student's knowledge in/on

LO1: characteristics of power electronics devices, gate firing circuits & commutation circuits for thyristor
LO2: control of 1-Φ semi and fully controlled bridge rectifiers & dual converters
LO3: control of choppers, AC voltage controller, cycloconverter & inverters
LO4: simulation of power electronics circuits using MATLAB

LIST OF EXPERMENTS

1. Characteristics of SCR, IGBT & MOSFET
2. Gate firing circuits for SCR
3. Forced commutation circuits (Class A, Class B, Class C & Class D)
4. Single phase semi controlled bridge converter with R &R-L Loads.
5. Single phase fully controlled bridge converter with R & R-L Loads.
6. Single Phase dual converter with R load
7. Four quadrant chopper
8. Single phase AC voltage controller
9. Single phase Cycloconverter
10. Single Phase Bridge inverter
11. Simulation of single-phase full wave rectifier with R and RL load using MATLAB
12. Simulation of single-phase AC voltage controller with R and RL load using MATLAB
13. Simulation of Sinusoidal Pulse Width Modulated inverter using MATLAB
14. Simulation of DC-DC converter using MATLAB (buck, boost, buck-boost, full-bridge)

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Laboratory Manual:

[1]. *Power Electronics Laboratory Manual*, Department of EEE, KITSW

Reference Books:

[1]. William J Palam III, *Introduction to MATLAB*, 2nd ed., New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2010.

[2]. P.S. Bhimbra, *Power Electronics*, 5th ed., New Delhi: Khanna Publishers, 2013.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: verify the characteristics of power semiconductor devices and output waveforms of firing & commutation circuits for SCRs

CO2: validate the average output voltage and draw the output waveforms of 1-phase semi and fully controlled bridge rectifiers & dual converters for different firing angles

CO3: validate the output waveforms of AC voltage controller, cycloconverter, inverter and chopper

CO4: simulate power electronic circuits and plot their output waveforms using MATLAB

Course Articulation Matrix: U18EE509 POWER ELECTRONICS LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE509.1	2	1	-	-	-	-	-	1	2	2	-	1	2	1
CO2	U18EE509.2	2	1	-	-	-	-	-	1	2	2	-	1	2	2
CO3	U18EE509.3	2	1	-	-	-	-	-	1	2	2	-	1	2	2
CO4	U18EE509.4	2	2	-	-	2	-	-	1	2	2	-	1	2	1
U18EE509		**2**	**1.25**	**-**	**-**	**2**	**-**	**-**	**1**	**2**	**2**	**-**	**1**	**2**	**1.5**

U18EC512 MICROPROCESSORS AND MICROCONTROLLER SYSTEMS LABORATORY

Class: B. Tech. V-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop student's knowledge in/on

LO1: assembly language programming on arithmetic, sorting, string & code conversion operations using 8085 microprocessor

LO2: interfacing I/O devices using 8085 microprocessor

LO3: assembly language programming on arithmetic & sorting using 8051 microcontroller

LO4: interfacing I/O devices using 8051 microcontroller

LIST OF EXPERIMENTS

I. Assembly Language Programming on 8085 Microprocessor using Hardware kit/Software:

1. Assembly Language Program (ALP) for 8-bit
   i. Addition
   ii. Subtraction
   iii. Multiplication
   iv. Division
2. ALP for
   i. Finding the sum of n -8 bit
   ii. Finding the average of n- 8bit numbers
   iii. Finding the sum of n-multi byte numbers
   iv. Finding the largest/smallest number in an array
   v. Arranging numbers in ascending/descending order
3. ALP for
   i. Comparing two strings of bytes
   ii. Finding the number of 1's in the given string
4. ALP to convert
   i. Binary data to BCD
   ii. BCD to binary data
   iii. Binary data to ASCII data
5. ALP to interface ADC/DAC to 8085 microprocessor
6. ALP to interface LED to 8085 microprocessor
7. ALP to interface stepper motor to 8085 microprocessor

II. Assembly Language Programming on 8051 Microcontroller using Hardware kit/Software:

1. Assembly Language Program (ALP) for arithmetic operations:
   i. Addition
   ii. Subtraction

iii. Multiplication
iv. Division

2. ALP for
   i. Finding the smallest/largest number in an array of numbers
   ii. Arranging an array of numbers in ascending/descending order
3. ALP to interface stepper motor to 8051microcontroller
4. ALP to interface seven segment LED display to 8051microcontroller

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Laboratory Manual:

1. *Microprocessors & Microcontroller Laboratory Manual*, Department of ECE, KITSW.

Reference Books:

1. Ramesh S. Gaonkar, *Microprocessor Architecture, Programming, and Applications with the 8085"*, Penram International.
2. Muhammed Ali Mazidi, *The 8051 Microcontrollers and Embedded systems using Assembly and C*, 2nd ed., 2006, Pearson, New Delhi.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: develop assembly language programs on arithmetic sorting, string & code conversion operations using 8085 microprocessor
CO2: develop assembly language programs for interfacing 8085 microprocessor with I/O devices
CO3: develop assembly language programs on arithmetic & sorting operations using 8051 microcontroller
CO4: develop assembly language programs for interfacing 8051 microcontroller with I/O devices

Course Articulation Matrix: U18EC512 MICROPROCESSORS AND MICROCONTROLLER SYSTEMS LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC512.1	2	-	1	-	1	-	-	1	2	2	-	1	2	1
CO2	U18EC512.2	2	2	1	1	1	-	-	1	2	2	-	1	2	1
CO3	U18EC512.3	2	-	-	1	1	-	-	1	2	2	-	1	2	1
CO4	U18EC512.4	2	2	1	-	1	-	-	1	2	2	-	1	2	1
U18EC512		**2**	**2**	**1**	**1**	**1**	**-**	**-**	**1**	**2**	**2**	**-**	**1**	**2**	**1**

U18EE510 SEMINAR

Class: B. Tech. V-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on

LO1: selecting topic, referring to peer reviewed journals / technical magazines / conference proceedings
LO2: literature review and well-documented report writing
LO3: creating PPTs and effective technical presentation
LO4: preparing a technical paper in scientific journal style & format

Student has to give independent seminar on the state-of-the-art technical topics relevant to their program of study, which would supplement and complement the program assigned to each student.

Guidelines:

1. The HoD shall constitute a Department Seminar Evaluation Committee (DSEC)
2. DSEC shall allot a faculty supervisor to each student for guiding on (i) selection of topic(ii)literature survey and work to be carried out (iii) preparing a report in proper format and (iv)effective seminar presentation
3. There shall be only Continuous Internal Evaluation (CIE) for seminar
4. The CIE for seminar is as follows:

Assessment	Weightage
Seminar Supervisor Assessment	20%
Seminar Report	30%
Seminar Paper	20%
DSEC Assessment: Oral presentation with PPT and viva-voce	30%
Total Weightage:	**100%**

Note: It is mandatory for the student to appear for oral presentation and viva-voce to qualify for course evaluation

(a) **Seminar Topic**: The topic should be interesting and conducive to discussion. Topics may be found by looking through recent issues of peer reviewed Journals / Technical Magazines on the topics of potential interest.
(b) **Report:** Each student is required to submit a well-documented report on the chosen seminar topic as per the format specified by *DSEC.*
(c) **Anti-Plagiarism Check:** The seminar report should clear plagiarism check as per the Anti-Plagiarism policy of the institute.
(d) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the *DSEC* as per the schedule notified by the department.
(e) The student has to register for the Seminar as supplementary examination in the following cases:
   i) he/she is absent for oral presentation and viva-voce

ii) he/she fails to submit the report in prescribed format
iii) he/she fails to fulfill the requirements of seminar evaluation as per specified guidelines.

(f) i) The CoE shall send a list of students registered for supplementary to the HoD concerned
ii) The DSEC, duly constituted by the HoD, shall conduct seminar evaluation and send the award list to the CoE within the stipulated time

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Course Learning Outcomes (COs):

On completion of this course, student will be able to…

CO1: select current topics in their engineering discipline & allied areas from peer reviewed journals / technical magazines/ conference proceedings

CO2: demonstrate the skills for performing literature survey, identify gaps, analyze the technical content and prepare a well-documented seminar report

CO3: create informative PPT and demonstrate communication skills through effective oral presentation showing knowledge on the subject & sensitivity towards social impact of the seminar topic

CO4: write a "seminar paper" in scientific journal style & format from the prepared seminar report

Course Articulation Matrix: U18EE510 SEMINAR

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE510.1	1	1	-	1	1	-	1	2	2	2	1	2	1	1
CO2	U18EE510.2	1	1	-	-	-	-	-	2	2	2	-	2	1	1
CO3	U18EE510.3	-	-	-	-	-	-	1	2	2	2	-	2	1	1
CO4	U18EE510.4	-	-	-	-	-	-	-	2	2	2	-	2	1	1
U18EE510		**1**	**1**	**-**	**1**	**1**	**-**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**1**

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15
(An Autonomous Institute under Kakatiya University, Warangal)
SCHEME OF INSTRUCTIONS & EVALUATION
VI-SEMESTER OF 4-YEAR B.TECH. DEGREE PROGRAMME

(7Th+3P+1Mini Project)

Sl.No	Course Category	Course Code	Course Name	Periods/week			Credits	Evaluation Scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	HSMC	U18TP601	Quantitative Aptitude & Logical Reasoning	2	-	-	1	10	30	40	60	100
2	HSMC	U18MH602	Management, Economics and Accountancy	3	-	-	3	10	30	40	60	100
3	PE	U18EE603	Professional Elective - II / MOOC-II	3	-	-	3	10	30	40	60	100
4	PCC	U18EE604	Power System Operation and Control	3	-	-	3	10	30	40	60	100
5	PCC	U18EE605	Power Semiconductor Drives	3	-	-	3	10	30	40	60	100
6	PCC	U18EE606	Control Systems Engineering	3	1	-	4	10	30	40	60	100
7	PCC	U18EI614	Signals & Linear Systems	3	-	-	3	10	30	40	60	100
8	PCC	U18EE607	Control Systems Engineering Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18EE608	Power Semiconductor Drives Laboratory	-	-	2	1	40	-	40	60	100
10	PROJ	U18EE610	Mini Project	-	-	2	1	100	-	100	-	100
			Total	**20**	**1**	**6**	**23**	**250**	**210**	**460**	**540**	**1000**
Additional Learning*:			*Maximum credits allowed for Honours/Minor*	-	-	-	*7*	-	-	-	-	-
			Total credits for Honours/Minor students:	**-**	**-**	**-**	**23+7**	**-**	**-**	**-**	**-**	**-**

** List of courses for additional learning through **MOOCs** towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

Note: L - Lectures; T – Tutorials; P – Practicals; CIE – Continuous Internal Evaluation; TA – Teachers Assessment; MSE – Mid Semester Examination; ESE – End Semester Examination;

Student Contact Hours/Week : 27
Total Credits(C) : 23

Professional Elective-II / MOOC - II
U18EE603A: Utilization of Electrical Energy
U18EE603B: High Voltage Engineering
U18EE603C: Electric Vehicles
U18EE603M: MOOCsCourse

U18TP501/U18TP601 QUANTITATIVE APTITUDE AND LOGICAL REASONING

Class: B. Tech. V-Semester
B. Tech.VI-Semester

Branch: ME, CSE, IT, CSN
CE, EIE, EEE, ECE, ECI

Teaching Scheme:

L	T	P	C
2	–	–	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: quantitative aptitude & problem-solving skills
LO2: computing abstract quantitative information
LO3: application of basic mathematics skills & critical thinking to draw conclusions
LO4: evaluating the validity & possible biases in arguments presented in authentic contexts

UNIT - I (6)

Quantitative Aptitude-I: Number system, Averages, Percentages, Ratios & proportions, Time, Speed & distance, Time and work, Data interpretation

UNIT - II (6)

Quantitative Aptitude-II: Simple Interest, Compound Interest, Profit & Loss, Ages, Permutations & Combinations, Probability

UNIT - III (6)

Logical Reasoning-I: Series completion, Analogy, Coding and decoding, Blood relations, Number, Ranking & Time sequence test, Linear & Circular arrangements

UNIT - IV (6)

Logical Reasoning-II: Data sufficiency, Logical Venn diagram, Syllogisms, Statement & arguments, Statement & Assumptions, Direction sense test

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Textbooks:

[1] R S Agarwal, *Quantitative Aptitude for Competitive Examinations*, 3rd ed., New Delhi: S. Chand Publications, 2019. *(Chapters 1,6,7,8,10,11,12,15,17,21,22,30,31)*

[2] R S Agarwal, *A Modern Approach to Verbal and Non-Verbal Reasoning*, 3rd ed. New Delhi: S. Chand Publications, 2019. *(Chapters Section I: 1,3,4,5,6,8,16, Section II: 2,3)*

Reference Books:

[1] Dinesh Khattar, *Quantitative Aptitude for Competitive Examinations*, New Delhi: Pearson India, 2019.

[2] Nishit K Sinha, *Reasoning for Competitive Examinations*, New Delhi: Pearson India, 2019.

[3] R.N. Thakur , *General Intelligence and Reasoning*, New Delhi: McGraw Hill Education, 2017.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: solve arithmetic relationships and interpret data using mathematical models

CO2: compute abstract quantitative information

CO3: apply basic mathematics & critical thinking skills to draw conclusions and solve problems

CO4: evaluate the validity &possible biases in arguments presented in authentic contexts logically & sensibly

Course Articulation Matrix: U18TP501/ U18TP601 QUANTITATIVE APTITUDE AND LOGICAL REASONING

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18TP501.1/ U18TP601.1	1	2	-	1	-	-	-	-	-	-	-	1	-	-
CO2	U18TP501.2/ U18TP601.2	1	2	-	1	-	-	-	-	-	-	-	1	-	-
CO3	U18TP501.3/ U18TP601.3	-	1	-	2	-	2	-	-	-	-	-	1	-	-
CO4	U18TP501.4/ U18TP601.4	-	1	-	2	-	2	-	-	-	-	-	1	-	-
U18TP501/ U18TP601		**1**	**1.5**	**-**	**1.5**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**

U18MH602 / U18MH701 MANAGEMENT ECONOMICS AND ACCOUNTANCY

Class: B. Tech.VI-Semester
B. Tech. VII-Semester

Branch: CE, EIE, EEE, ECE & ECI
ME, CSE, IT & CSN

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: basic concepts of management
LO2: concepts of economics and forms of business organizations
LO3: fundamentals of accountancy and journalising
LO4: preparation of final accounts

UNIT-I (9)

Management: Meaning and definition, Scientific Management - Definition, Characteristics, Principles of management

Functions of Management: Planning - Definition, Characteristics; Organizing - Definition, Characteristics; Staffing - Meaning, Functions of personnel management; Directing- Leadership, Nature; Motivation – Nature, Types (financial, non-financial, intrinsic and extrinsic), Communication- Process, Types, Co-ordination- Definition, Steps to achieve effective coordination, Controlling- Definition, process

UNIT-II (9)

Economics: Meaning and definition, Scope, Micro and Macro Economics, Methods of Economics, Laws of Economics

Forms of Business Organization: Sole Proprietor ship, Partnership firm - Types of Partners, Cooperative society, Joint stock company - Features, Types, Merits and demerits

UNIT-III (9)

Double Entry System and Book Keeping: Accounting concepts and conventions, Overview of accounting cycle, Journal-meaning, Journalizing, Ledger - Meaning, Ledger posting, Balancing; Cash book (Single column), Preparation of Trial balance

UNIT – IV (9)

Final Accounts: Trading Account, profit and loss account and Balance Sheet with simple adjustments

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Textbooks:

[1] Y. K. Bhushan, *Fundamentals of Business Organization and Management*, 20th ed. New Delhi: Sultan Chand & Sons, 2017. (*Chapters 1, 2 & 4*)

[2] T. S. Grewal, S.C. Gupta, *Introduction to Accountancy*, 8th ed. New Delhi: S. Chand Publications, 2014.

(*Chapters 1, 2, 3, 4, 6 & 8*)

Reference Books:

[1] Harold Koontz and Heinz Weihrich, *Essentials of Management*, 6th ed., New Delhi: Tata Mc Graw Hill Publications, 2006.

[2] L.M. Prasad, *Principles and Practice of Management*, 9th ed., New Delhi: Sultan Chand, 2016.

[3] R.L. Gupta & V.K. Gupta, *Principles and Practice of Accountancy*, 14th ed., New Delhi: Sultan Chand and Sons, 2018.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: comprehend the basic concepts of management

CO2: distinguish between micro & macro economics& forms of business organizations

CO3: pass journal entries & post them into ledgers

CO4: prepare profit & loss accounts and assess the financial position through the balance sheet

Course Articulation Matrix: U18MH602/U18MH701 MANAGEMENT ECONOMICS AND ACCOUNTANCY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18MH602/ U18MH701.1	-	-	-	-	-	-	-	-	1	1	1	1	-	-
CO2	U18MH602/ U18MH701.2	-	-	-	-	-	-	-	-	1	1	2	1	-	-
CO3	U18MH602/ U18MH701.3	-	-	-	-	-	-	-	-	-	-	1	1	-	-
CO4	U18MH602/ U18MH701.4	-	-	-	-	-	-	-	-	-	-	1	1	-	-
U18MH602/ U18MH 701		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1.25**	**1**	**-**	**-**

U18EE603A UTILIZATION OF ELECTRICAL ENERGY

Class: B. Tech.VI-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on …

LO1: electric traction systems and speed control of DC and AC traction motors
LO2: selection of motor for industrial applications
LO3: electric heating and welding techniques
LO4: illumination, lamps, lighting schemes and power factor correction

UNIT-I (9)

Electric Traction: Systems of electric traction, transmission of drive, mechanics of traction movement, trapezoidal and quadrilateral speed – time curves, tractive effort, power and energy output from driving axles, specific energy output, specific energy consumption, factors effecting the specific energy consumption and coefficient of adhesion, concept of average speed and schedule speed, Speed control methods of DC traction motors-rheostatic, field control, series-parallel method, Speed control methods of AC traction motors, shunt-bridge transition, Collection of current - third rail, overhead wires, pantograph

UNIT-II (9)

Industrial Drives: Introduction, factors governing selection of electric motors, nature of electric supply, types of drives, nature of loads, standard ratings of motors, choice of ratings of motors, types of motors used in industrial drives, cement manufacturing industries, textile mills, paper mills, ship propulsion drives

UNIT-III (9)

Electric Heating: Elementary principle of heat transfer, Stefan's law, types of electric furnaces, resistance furnace, design of heating element, losses and efficiency, construction and working of different types of induction furnaces – dielectric heating, arc furnaces

Electric Welding: Types of welding, resistance, gas and arc welding, characteristics of carbon and metal arc welding, comparison

UNIT-IV (9)

Illumination(qualitative treatment only): Terminology, Laws of illumination, coefficient of utilisation and depreciation, polar curves, sources of light- fluorescent lamps, compact fluorescent lamps, LED lamps, discharge lamps, mercury vapour lamps, sodium vapour lamps and neon lamps, comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, types and design of lighting scheme, lighting calculations for a given surface, Factory lighting, street lighting and

flood lighting

Power Factor Correction: Introduction, disadvantages of a low power factor, causes of low power factor, power factor improvement, economics of power factor improvement, most economical power factor when kW demand is constant, most economical power factor when kVA demand is constant

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Textbook:

[1]. J.B. Gupta, *Utilization of Electric Power & Electric Traction*, 10thed., New Delhi: S.K. Kataria& Sons, 2012.

Reference Books:

[1]. E. Openshaw Taylor, *Utilization of Electric Energy*, 1st ed., (SI), Hyderabad: Orient Longman private limited, 1971 (reprint 2006).

[2]. C.L. Wadhwa, *Generation Distribution and Utilization of Electrical Energy*, 5th ed., New Delhi: New Age International Pvt. Ltd., 2015.

[3]. H. Partab, *Art and Science of Utilisation of Electrical Energy*, 3rd ed., New Delhi: Dhanpat Rai publishing company pvt. ltd., 2017.

[4]. R.K. Rajput, *Utilisation of Electrical Power*, 2nd ed., New Delhi: Laxmi Publications, 2016.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: compute tractive effort, specific energy consumption for different speed-time curves
CO2: identify suitable motors for industrial applications
CO3: design circular and ribbon type heating element and describe the welding techniques
CO4: design lighting scheme for a given surface and determine the capacitance for power factor improvement

Course Articulation Matrix: U18EE603A UTILIZATION OF ELECTRICAL ENERGY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE603A.1	2	-	-	-	-	1	-	-	-	-	-	1	2	1
CO2	U18EE603A.2	2	-	-	-	-	1	-	-	-	-	-	1	2	1
CO3	U18EE603A.3	2	1	1	-	-	1	-	-	-	-	-	1	2	1
CO4	U18EE603A.4	2	1	1	-	1	1	1	-	-	-	-	1	2	1
U18EE603A		**2**	**1**	**1**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**1**

U18EE603B HIGH VOLTAGE ENGINEERING

Class: B. Tech.VI-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on …

LO1: breakdown mechanisms in solid, liquid and gaseous dielectrics

LO2: methods and circuits to generate high DC, AC, impulse voltages and currents

LO3: techniques employed in high voltage and current measurements

LO4: causes of over voltages and impulse and power frequency tests on the power system components

UNIT – I (9)

Breakdown Mechanism of Gases: Townsend's first ionization coefficient, cathode processor, secondary effects, Townsend's second ionization coefficient, Townsend's breakdown mechanism, experimental determination of coefficients and breakdown in electronegative gases, steamer or Kanal mechanism of breakdown, Paschen's Law, Penning effect, breakdown in non-uniform fields and corona discharges, time – lag, practical considerations in using gases for insulation purposes, vacuum insulation

Breakdown Mechanism of Solids and Liquids: Introduction, intrinsic breakdown, electro mechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, chemical and electro chemical deterioration and breakdown, breakdown due to treeing and tracking, breakdown due to internal discharges, breakdown in composite dielectrics, liquids as insulators, pure liquids and commercial liquids, conduction and breakdown in commercial liquids – suspended particle theory, cavitation and the bubble theory, thermal mechanism of breakdown, stressed volume theory

UNIT – II (9)

Generation of High DC & AC Voltages and Currents: Half wave rectifier circuit, voltage doubler circuits, Cockcroft-Walton voltage multiplier circuit, electrostatic generator, Vande Graaff generator, generation of high AC voltages, cascaded transformers, resonant transformer, generation of high frequency AC High voltages, generation of rectangular current pulses, tripping control of impulse generator

Generation of High Impulse Voltages and Currents: Definition of impulse currents & voltages, impulse voltage generator circuits, Marx's multistage voltage generator, tripping control of impulse voltage generator, generation of switching surges, definition of impulse current wave forms, impulse current generator

UNIT – III (9)

Measurement of High Voltage DC, AC and Impulse Voltages: High ohm series resistance, resistance

potential divider, R-C capacitive voltage divider, generating voltmeter series capacitance voltmeter, CVT, electrostatic voltmeters, peak reading AC voltmeters (Chubb– Fortescue method), spherical measurements (spherical gaps) for high DC and AC voltages, impulse voltages

Measurement of High Currents: Hall generators for DC current measurements, resistive shunts, bipolar strip shunt, coaxial tubular shunt, squirrel cage shunts

Cathode Ray Oscillographs for Impulse Measurements

UNIT – IV (9)

Overvoltage Phenomenon: Lightning phenomenon, overvoltages due to switching surges, system faults and other abnormal conditions, principle of insulation co-ordination on HV and EHV power systems

High Voltage Testing Techniques: Power frequency and impulse testing of insulators, bushings, cables, transformers, surge diverters, isolators and circuit breakers

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Textbook:

[1]. M.S. Naidu,V. Kamaraju, *High Voltage Engineering*, 6thed.,New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2019.

Reference books:

[1]. E. Kuffel, W. S. Zaengl, and J. Kuffel, *High Voltage Engineering Fundamentals*, 2nd ed., Oxford: Newnes (Elsevier), 2010.

[2]. D. Kind, K. Feser, *High Voltage Test Techniques*, 2nd ed., Oxford: Newnes (Elsevier), 2001.

[3]. C.L. Wadhwa, *High Voltage Engineering*, 3rd ed., New Delhi: New Age International Pvt. Ltd., 2012.

[4]. Subir Ray, *An Introduction to High Voltage Engineering*, 2nd ed., New Delhi: Prentice Hall of India, 2013.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: identify the breakdown mechanisms in solid, liquid or gaseous dielectric media

CO2: apply the principles of machines and electronic circuits to generate high AC, DC, impulse voltages & currents

CO3: apply the principles of electrical measurements for measuring high voltages & currents

CO4: identify the causes of overvoltages in power systems and describe the power frequency & impulse tests conducted on power system components

Course Articulation Matrix: U18EE603B HIGH VOLTAGE ENGINEERING															
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18EE603B.1	1	2	-	-	-	1	-	-	-	-	-	1	2	-
CO2	U18EE603B.2	2	1	-	-	-	1	-	-	-	-	-	-	2	1
CO3	U18EE603B.3	2	1	-	-	-	1	-	-	-	-	-	-	2	-
CO4	U18EE603B.4	2	1	-	-	-	1	-	-	-	-	-	1	2	-
U18EE603B		**1.75**	**1.25**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**

U18EE603C ELECTRIC VEHICLES

Class: B. Tech.VI-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on …

LO1: electric vehicles and types of batteries

LO2: electric machines and controllers used in electric vehicles

LO3: modeling of scooter, small electric car and battery electric vehicle

LO4: charging and modeling of batteries

UNIT-I (9)

Introduction to Electric Vehicles (EVs): Brief History of EVs, Electric vehicles and the environment: Vehicle pollution, Developments towards the end of the 20th century, types of electric and hybrid electric vehicles in use today, electric vehicles for the future

Batteries: Introduction, Battery parameters, Types - Lead acid batteries, Nickel-based batteries, Sodium-based batteries, Lithium batteries, Metal air batteries, Use of batteries in electric and hybrid vehicles

UNIT-II (9)

Electric Machines and Controllers for EVs: Brushed DC electric motor, DC regulation: buck and boost regulators and voltage conversion: single phase and three phase inverters

Brushless Electric Motors: Brushless DC motor, switched reluctance motors, induction motor, motor cooling, efficiency, size and mass, electrical machines for hybrid vehicles

UNIT-III (9)

Electric Vehicle Modelling: Tractive effort-rolling resistance force, aerodynamic drag, hill climbing force, acceleration force, total tractive effort; Modelling vehicle acceleration: acceleration performance parameters, modelling the acceleration of an electric scooter, modelling the acceleration of a small car, Modelling electric vehicle range: driving cycles, range modelling of battery electric vehicles, constant velocity range modelling

UNIT-IV (9)

Battery Charging: Battery chargers, charge equalization, designer's choice of battery

Battery Modelling: The purpose of battery modelling, battery equivalent circuit, modelling battery capacity, simulation of a battery at a set power, calculating the Peukert coefficient, approximate battery sizing

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Textbooks:

[1]. James Larminie, John Lowry, *Electric Vehicle Technology Explained*, John Wiley & Sons Ltd., 1st ed., 2003.

Reference Books:

[1]. C. Mi, M. A. Masrur and D. W. Gao, *Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives*, John Wiley & Sons, 2nd ed., November 2017.

[2]. S. Onori, L. Serrao and G. Rizzoni, *Hybrid Electric Vehicles: Energy Management Strategies*, Springer, 1st ed., 2016.

[3]. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, *Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design*, CRC Press, 1st ed., 2005.

[4]. T. Denton, *Electric and Hybrid Vehicles*, Taylor & Francis Group, 1st ed., 2016.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: classify electric vehicles and describe various batteries

CO2: identify motors and controllers used in electric vehicles

CO3: model electric scooter, small electric car and battery electric vehicle

CO4: take part in design and simulation of the batteries used in electric vehicles

Course Articulation Matrix: U18EE603C Electric Vehicles

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE603C.1	1	-	-	-	-	1	1	-	-	-	-	1	1	-
CO2	U18EE603C.2	1	-	-	-	-	1	1	-	-	-	-	1	1	-
CO3	U18EE603C.3	2	1	1	-	1	1	1	-	-	-	-	1	2	1
CO4	U18EE603C.4	2	1	1	-	1	1	1	-	-	-	-	1	2	1
U18EE603C		**1.5**	**1**	**1**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1.5**	**1**

U18EE604 POWER SYSTEM OPERATION AND CONTROL

Class: B. Tech.VI-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on …

LO1: computation of load flows in a power system

LO2: economic load scheduling and unit commitment

LO3: load frequency control in an isolated and two-area power system

LO4: stability, stability limits and the dynamics of synchronous machines

UNIT – I (9)

Load flow studies: Introduction, Bus classification, Nodal admittance matrix, load flow equations, Iterative methods – Gauss, Gauss-Seidel and Newton-Raphson methods, Newton decoupled and fast decoupled, merits and demerits of these methods

UNIT – II (9)

Economic Operation of Power Systems: Distribution of load between units within a plant, transmission loss as a function of plant generation, calculation of loss coefficients, distribution of load between plants Unit commitment: introduction, constraints in unit commitment problems

UNIT – III (9)

Load Frequency control: Introduction, load frequency problem, megawatt frequency (or P-F) control channel, MVAr voltage (or Q – V) control channel, dynamic interaction between P-F and Q-V loops, mathematical model of speed governing system, turbine models division of power system into control areas, P-F control of single control area (uncontrolled and PI controlled cases) P-F control of two area systems (uncontrolled and PI controlled cases)

UNIT – IV (9)

Power System rotor angle Stability: The stability problem, steady state stability, transient stability, dynamic stability, steady state stability limit, swing equation, equal area criterion of stability and its applications, critical clearing angle, step by step solution of swing equation, factors affecting transient stability & methods improving stability

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Textbook:

[1]. I.J. Nagarath & D.P. Kothari, *Modern Power System Analysis*, 4th ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2012.

Reference Books:

[1]. C.L. Wadhwa, *Electrical Power Systems*, 7th ed., New Delhi: New Age International Pvt. Ltd., 2016.

[2]. O. I. Elgerd, *Electric Energy Systems Theory*, 2nd ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2011.
[3]. J. Grainger & W.D. Stevenson, *Power System Analysis*, New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2003.
[4]. Chakrabarthi, Abhijit Halder, *Power System Analysis: Operation and Control*, 3rd ed., New Delhi: Prentice hall of India, 2010.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.
Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.
Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):
On completion of this course, the students will be able to…
CO1: compute the state variables & the power flows in a power system using Gauss-Seidel & Newton-Raphson methods
CO2: determine the optimal economic load scheduling for a given power demand
CO3: describe the frequency response of a single area & two area system with and without PI controllers
CO4: analyse the stability of power systems and determine the critical clearing angle & critical clearing time

Course Articulation Matrix: U18EE604 POWER SYSTEM OPERATION AND CONTROL

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE604.1	2	2	-	-	-	1	1	-	-	-	-	1	2	1
CO2	U18EE604.2	2	2	-	-	-	1	1	-	-	-	-	1	2	1
CO3	U18EE604.3	2	1	-	-	-	1	1	-	-	-	-	1	2	1
CO4	U18EE604.4	2	2	-	-	-	1	1	-	-	-	-	1	2	1
U18EE604		**2**	**1.75**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**1**

U18EE605 POWER SEMICONDUCTOR DRIVES

Class: B. Tech.VI-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on …

LO1: fundamentals and dynamics of electric drives

LO2: rectifier control and chopper control of DC drives

LO3: AC voltage control, frequency control and slip power recovery control of induction motor drives

LO4: synchronous motor drives and its speed-torque characteristics

UNIT-I (9)

Fundamentals of Electric Drives: Electric drives, advantages of electric drives, parts of electric drives, choice of electric drives, status of DC drives and AC drives, Starting, braking, speed control of motors, Dynamics of electric drives: fundamental torque equations, types of load, quadrant diagram of speed-torque characteristics, dynamics of load torque combinality, steady state stability and transient stability of an electric drives, load equalization, calculation of time and energy loss in transient operation, drive specifications

UNIT-II (9)

Rectifier Control of DC drives: Controlled rectifier circuits, braking operation of rectifier controlled separately excited DC motor, single phase and three phase half and fully controlled rectifier fed separately excited DC motor, multi quadrant operation of fully controlled rectifier fed separately excited DC motor

Chopper control of DC drives: chopper control of separately excited and series DC motors, multi quadrant control of chopper fed motors

UNIT-III (9)

Control of Induction Motor Drives: Braking and speed control of induction motor

AC Voltage Controllers: control of induction motor by AC voltage controllers

Frequency-controlled Induction Motor Drives: control of induction motor by Voltage Source Inverter (VSI), Current Source Inverter (CSI), Current controlled PWM inverters

Slip Power-controlled Wound-Rotor Induction Motor Drives: static rotor resistance control, constant torque and constant power drives (*static Scherbius & Kramer drives)*

UNIT-IV (9)

Control of Synchronous Motor Drives: Braking and speed control of synchronous motor, Operation of cylindrical rotor synchronous motor from VSI and CSI, self-controlled synchronous motor drives using

cycloconverters, permanent magnet AC motor drives

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Textbook:

[1]. G.K. Dubey, *Fundamentals of Electrical Drives*, 2nd ed., New Delhi: Narosa Publishers, Reprint: 2019.

Reference Books:

[1]. Vedam Subrahmanyam, *Thyristor Control of Electrical Drives*, 2nd ed., New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2010.
[2]. B.K. Bose, *Modern Power Electronics & A.C Drives*, New Delhi: Pearson edu. Pvt. Ltd., 2002
[3]. P.S. Bimbhra, *Power Electronics*, 6th ed., New Delhi: Khanna Publishers, 2012.
[4]. N.K. De and P.K. Sen, *Electrical Drives*, New Delhi: Prentice Hall of India, 1999.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: estimate the requirements of industrial drives
CO2: design control schemes for rectifier &chopper-controlled DC drives
CO3: design control schemes for squirrel cage and wound rotor induction motor drives
CO4: distinguish the operation of self-controlled & true controlled synchronous motor drive

Course Articulation Matrix: U18EE605 POWER SEMICONDUCTOR DRIVES

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE605.1	2	-	-	-	-	1	-	-	-	-	-	1	2	1
CO2	U18EE605.2	2	1	-	1	-	1	-	-	-	-	-	1	2	1
CO3	U18EE605.3	2	1	-	1	-	1	-	-	-	-	-	1	2	1
CO4	U18EE605.4	2	-	-	-	-	1	-	-	-	-	-	1	2	1
U18EE605		**2**	**1**	**-**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**

U18EE606 CONTROL SYSTEMS ENGINEERING

Class: B. Tech.VI-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	1	–	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on …

LO1: transfer function representation of physical systems

LO2: assessing the system performance using time domain analysis and methods for improving it

LO3: assessing the system's stability and performance using frequency domain analysis

LO4: state space modeling of physical systems and the compensation techniques

UNIT-I (9+3)

Concepts of Control systems: Introduction, classification of control systems, open loop and closed loop control systems, effects of feedback, mathematical modeling – linear differential equations-translational and rotational mechanical systems, analogous systems, electro-mechanical systems, electrical systems

Block diagram reduction technique, signal flow graph method, Mason's Gain formula

UNIT-II (9+3)

Control System Components: AC & DC Servomotors, Synchros

Time Response Analysis: Introduction, standard test signals – type & order, time response of first order systems, classification of second order systems, transient response of second order systems – time domain specifications – steady state response – steady state errors and error constants, Controllers - P, I, D, PI, PD& PID

UNIT-III (9+3)

Stability Analysis: Introduction, Routh-Hurwitz stability criteria – qualitative stability and conditional stability, root locus technique– construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci

Frequency Response Analysis: Introduction, frequency domain specifications -correlation between frequency and time domain specifications- bode plots- transfer function from the bode plot- phase margin and gain margin-stability analysis from Bode plots, stability analysis through polar plots, Nyquist stability criteria, **determining the response of systems using MATLAB**

UNIT-IV (9+3)

Control System Analysis using State Variable Method: Introduction- state variable representation-conversion of state models to transfer functions- conversion of transfer functions to state models-deriving state models from physical systems, state transition matrix, solution of state equations-concepts of controllability and observability

Compensation: Introduction, elementary treatment of lead, lag and lead-lag compensation

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Textbook:

[1]. I.J. Nagrath & M. Gopal, *Control Systems Engineering*, 4thed., New Delhi: New Age International Pvt. Ltd., 2012.

Reference Books:

[1]. S. Palani, *Control Systems Engineering*, 2nd ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2010.
[2]. A. Anand Kumar, *Control Systems*, 2nd ed., New Delhi: Prentice Hall of India, 2014.
[3]. K. Alice Mary, P. Ramana, *Control Systems*, Hyderabad: Universities Press, 2016.
[4]. Benjamin C. Kuo, *Automatic Control Systems*, 7th ed., New Delhi: Prentice Hall of India, 1995.
[5]. A. Nagoorkani, *Control Systems*, 2nd ed., New Delhi: RBA Publications.
[6]. K. Ogata, *Modern Control Engineering,* 5th ed., New Delhi: Prentice Hall of India, 2010

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: develop transfer function models for dynamic systems
CO2: evaluate time domain specifications of first & second order systems and compare the performance of different controllers
CO3: analyze stability of systems in time & frequency domains
CO4: develop state space model of a given physical system and understand the basic concepts of compensating techniques

Course Articulation Matrix: U18EE606 CONTROL SYSTEMS ENGINEERING

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE606.1	2	2	-	-	-	-	-	-	-	-	-	1	2	-
CO2	U18EE606.2	2	2	-	1	-	-	-	-	-	-	-	1	2	1
CO3	U18EE606.3	2	2	-	1	1	-	-	-	1	-	-	1	2	1
CO4	U18EE606.4	2	2	-	1	-	-	-	-	1	-	-	1	2	1
U18EE606		**2**	**2**	**-**	**1**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**1**

U18EI614 SIGNALS AND LINEAR SYSTEMS

Class: B. Tech.VI-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on …

LO1: continuous-time (CT), discrete-Time (DT) signals, systems and convolution

LO2: continuous-time Fourier transforms (CTFT) and discrete-time Fourier series

LO3: discrete-time Fourier series (DTFS) and discrete-time Fourier transform (DTFT) and its applications

LO4: z-Transform, stability of LTI systems and realizations of IIR systems

UNIT – I (9)

Signals and Systems: Continuous-time (CT) and discrete-time (DT) signals, sampling theorem (statement only), exponential and sinusoidal signals, singularity functions, CT & DT systems, basic system properties

Linear Time–Invariant (LTI) Systems: DT-LTI systems, convolution sum, CT-LTI systems, convolution integral, properties of LTI systems, LTI systems described by differential and difference equations, FIR and IIR systems

UNIT – II (9)

Continuous-Time Fourier Transform (CTFT): CTFT for representation of aperiodic signals, CTFT for periodic signals, properties of the CTFT, convolution property, multiplication property, systems characterized by linear constant–coefficient differential equations (LCCDE)

UNIT – III (9)

Discrete-Time Fourier Transform (DTFT): DTFT for aperiodic signals, DTFT for periodic signal, properties for the DTFT, convolution property, multiplication property, systems characterized by linear constant-coefficient difference equations (LCCDE)

UNIT – IV (9)

***z*-Transform:** *z*-transform, region of convergence (ROC), properties of *z*-transform, *z*-transform of some common signals, **Inverse *z*-transform**: power series method, partial fractions method and Cauchy's integral method, Analysis and characterization of LTI system using *z*-transform

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Textbook:

[1]. Alan V. Oppenheim and Alan S. Willsky with S. Hamid Nawab, *Signals & Systems*, 2nd ed., New Delhi: Prentice Hall of India, 2010 (Chapters 1,2,3,4,5 and 10).

Reference Books:

[1]. Simon Haykin and Barry Van Veen, *Signals & Systems*, 2nd ed., New Delhi: Wiley India, 2008.

[2]. Mrinal Mandal and Amir Asif, *Continuous and Discrete Time Signals and Systems*, Cambridge: Cambridge University Press, 2008.

[3]. M.J. Roberts and Govind Sharma, *Fundamentals of Signals and Systems*, 2nd ed., New york: McGraw Hill, 2010.

[4]. H.P. Hsu, *Signals & Systems*, Schaum's Outlines (McGraw Hill), 2nd ed., New York: McGraw Hill 2009.

[5]. B.P. Lathi, *Signals Systems and Communication*, New Jersey: John Wiley & Sons, 1965.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: classify CT / DT Signals & Systems and find the response of an LTI system to any arbitrary signal using convolution

CO2: evaluate CTFT of standard signals and use properties of CTFT for solving LCCDE

CO3: compute DTFT of standard signals and derive properties of DTFT and use them for solving LCCDE

CO4: determine the z-transform of standard DT signals with ROC, use properties of z-transform to solve difference equations, evaluate stability of an LTI system and realize the DT systems in direct, cascade & parallel forms

Course Articulation Matrix: U18EI614 SIGNALS AND LINEAR SYSTEMS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EI614.1	1	1	1	-	-	-	-	-	-	-	-	1	1	-
CO2	U18EI614.2	1	2	1	1	-	-	-	-	-	-	-	1	1	-
CO3	U18EI614.3	1	2	1	1	-	-	-	-	-	-	-	1	1	-
CO4	U18EI614.4	1	2	1	1	-	-	-	-	-	-	-	1	1	-
U18EI614		**1**	**1.75**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**

U18EE607 CONTROL SYSTEMS ENGINEERING LABORATORY

Class: B. Tech.VI-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop student's knowledge in/on …

LO1: time response of second order system, synchros

LO2: lag-lead compensators, armature-controlled DC motor and AC servomotor

LO3: stability analysis of LTI systems using MATLAB

LO4: controllability, observability and analysis of LTI systems using MATLAB

LIST OF EXPERIMENTS

1. Determination of time domain specifications of uncontrolled second order system.
2. Study performance of P, PI, PID controllers for a second order system
3. Study of characteristics of Synchro Transmitter-Receiver pair
4. Analysis of Lag and lead compensation with reference to Magnitude and phase plot
5. Determination of transfer function for armature-controlled DC motor
6. Study of Characteristics of AC servomotor
7. Stability analysis through Root Locus plot of L.T.I. system using MATLAB
8. Stability analysis through Bode plot of L.T.I. system using MATLAB
9. Stability analysis through Polar plot of L.T.I. system using MATLAB
10. Stability analysis through Nyquist criteria using MATLAB
11. Verification of Controllability & Observability of L.T.I system using MATLAB
12. Linear system analysis (Time domain analysis, Error analysis) using MATLAB

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Laboratory Manual:

[1]. *Control Systems Laboratory Manual,* Department of EEE, KITSW

Reference Books:

KITSW-Syllabi for III to VIII Semester B.Tech. EEE 4-year Degree Programme

[1]. A. Anand Kumar, *Control Systems*, 2nd ed., New Delhi: Prentice Hall of India, 2014.
[2]. M. Gopal, *Control System Principles & Design,* 2nd ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2012

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: determine time response specifications of uncontrolled & controlled second order system and plot the characteristics of synchros
CO2: plot the characteristics of lag-lead compensators, armature-controlled DC motor & AC servomotor
CO3: analyze the stability of LTI systems using MATLAB
CO4: determine controllability & observability of a given LTI system using MATLAB

Course Articulation Matrix: U18EE607 CONTROL SYSTEMS ENGINEERING LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE607.1	2	-	-	-	-	-	-	-	2	2	-	1	2	-
CO2	U18EE607.2	2	-	-	-	-	-	-	-	2	2	-	1	2	-
CO3	U18EE607.3	2	1	-	-	2	-	-	-	2	2	-	1	1	-
CO4	U18EE607.4	2	1	-	-	2	-	-	-	2	2	-	1	1	-
U18EE607		**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**2**	**-**	**1**	**1.5**	**-**

U18EE608 POWER SEMICONDUCTOR DRIVES LABORATORY

Class: B. Tech.VI-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop student's knowledge in/on …

LO1: single phase and three phase converter-controlled drives

LO2: single phase VSI, AC voltage controlled and cycloconverter controlled drive

LO3: chopper controlled DC drive and control of induction drive

LO4: simulation of drives using MATLAB-Simulink

LIST OF EXPERIMENTS

1. Single phase fully converter controlled drive
2. Single phase semi converter controlled drive
3. Three phase fully/semi converter controlled drive
4. Single phase VSI-PWM control drive
5. Single phase AC voltage converter controlled drive
6. Single phase Cyclo-converter controlled drive
7. Four quadrant chopper fed DC drive
8. Buck Converter controlled DC drive
9. Rotor resistance control of wound rotor induction drive
10. Closed loop control of three phase induction drive
11. Simulation of single-phase fully controlled converter DC drive using MATLAB-Simulink
12. Simulation of VSI controlled induction motor drive using MATLAB-Simulink

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Laboratory Manual:

[1]. *Power Semiconductor Drives Laboratory Manual,* Department of EEE, KITSW.

Reference book:

[1]. G.K. Dubey, Fundamentals of Electrical Drives, 2nd ed., New Delhi: Narosa Publishers, 1988.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: determine the voltage and speed of single phase and three phase converter-controlled DC drives for different firing angles

CO2: determine the voltage and speed of AC drives controlled by VSI, AC voltage controller & cycloconverter

CO3: determine the voltage and speed of chopper-controlled DC drive for different duty cycles& speed characteristics of induction drives for varying loads.

CO4: simulate AC & DC drives using MATLAB-Simulink and draw the corresponding characteristics

Course Articulation Matrix: U18EE608 POWER SEMICONDUCTOR DRIVES LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE608.1	2	1	-	-	-	-	-	1	2	2	-	1	2	1
CO2	U18EE608.2	2	1	-	-	-	-	-	1	2	2	-	1	2	1
CO3	U18EE608.3	2	1	-	-	-	-	-	1	2	2	-	1	2	1
CO4	U18EE608.4	2	1	-	-	2	-	-	1	2	2	-	1	2	1
U18EE608		**2**	**1**	**-**	**-**	**2**	**-**	**-**	**1**	**2**	**2**	**-**	**1**	**2**	**1**

U18EE610 MINIPROJECT

Class: B. Tech.VI-Semester **Branch:** Electrical & Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on….

LO1: *implementing a project independently by applying knowledge to practice*
LO2: *literature review and well-documented report writing*
LO3: *creating PPTs and effective technical presentation skills*
LO4: *writing technical paper in scientific journal style & format and creating video pitch*

Student has to take up independent mini project on innovative ideas, innovative solutions to common problems using their knowledge relevant to courses offered in their program of study, which would supplement and complement the program assigned to each student.

Guidelines:

1. The HoD shall constitute a *Department Mini Project Evaluation Committee (DMPEC)*
2. *DMPEC* shall allot a faculty supervisor to each student for guiding on (i) selection of topic (ii) literature survey and work to be carried out (iii) preparing a report in proper format and (iv) effective mini project oral presentation
3. There shall be only continuous Internal Evaluation (CIE) for miniproject
4. The CIE for mini project is as follows:

Assessment	Weightage
Mini Project Supervisor Assessment	20%
Working model / process / software package / system developed	20%
Mini Project report	20%
Mini Project paper	10%
Video pitch	10%
DMPEC Assessment: *Oral presentation with PPT and viva-voce*	20%
Total Weightage:	**100%**

Note: It is mandatory for the student to appear for oral presentation and viva-voce to qualify for course evaluation

(g) **Mini Project Topic**: The topic should be interesting and conducive to discussion. Topics may be found by looking through recent issues of peer reviewed Journals / Technical Magazines on the topics of potential interest

(h) **Working Model**: Each student is requested to develop a working model / process / system on the chosen work and demonstrate before the *DMPEC* as per the dates specified by *DMPEC*

(i) **Report:** Each student is required to submit a well-documented report on the chosen seminar topic as per the format specified by *DMPEC*

(j) **Anti-Plagiarism Check:** The seminar report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

(k) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the *DMPEC* as per the schedule notified by the department

(l) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his / her mini project. Video pitch should be no longer than 5 minutes by keeping the pitch concise and to the point, which shall also include key points about his / her business idea / plan (*if any*) and social impact

(m) The student has to register for the Mini project as supplementary examination in the following cases:

iv) he/she is absent for oral presentation and viva-voce

v) he/she fails to submit the report in prescribed format

vi) he/she fails to fulfill the requirements of Mini project evaluation as per specified guidelines

(n) i) The CoE shall send a list of students registered for supplementary to the HoD concerned

ii) The DSEC, duly constituted by the HoD, shall conduct Mini project evaluation and send the award list to the CoE within the stipulated time

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Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: apply knowledge to practice to design & conduct experiments and utilize modern tools for developing working models / process / system leading to innovation & entrepreneurship

CO2: demonstrate the competencies to perform literature survey, identify gaps, analyze the problem and prepare a well-documented Mini project report

CO3: make an effective oral presentation through informative PPTs, showing knowledge on the subject & sensitivity towards social impact of the Mini project

CO4: write a "Mini project paper" in scientific journal style & format from the prepared Mini project report and create a video pitch on Mini project

Course Articulation Matrix: U18EE610 MINI PROJECT

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE610.1	1	1	2	2	1	1	1	2	2	2	1	2	1	1
CO2	U18EE610.2	1	1	-	2	-	-	-	2	2	2	-	2	1	1

CO3	U18EE610.3	-	-	-	-	-	-	1	2	2	2	-	2	1	1
CO4	U18EE610.4	-	-	-	-	-	-	-	2	2	2	-	2	1	1
U18EE610		**1**	**1**	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**1**

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15

(An Autonomous Institute under Kakatiya University, Warangal)

SCHEME OF INSTRUCTIONS & EVALUATION

VII-SEMESTER OF 4-YEAR B.TECH. DEGREE PROGRAMME

(4Th+2P+1MC+1Major Project)

Sl.No	Course Category	Course Code	Course Name	Periods/week			Credits	Evaluation Scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	OE	U18OE701	Open Elective- III	3	-	-	3	10	30	40	60	100
2	PE	U18EE702	Professional Elective - III / MOOC-III	3	-	-	3	10	30	40	60	100
3	PE	U18EE703	Professional Elective - IV / MOOC-IV	3	-	-	3	10	30	40	60	100
4	PCC	U18EE704	Power System Protection	3	-	-	3	10	30	40	60	100
5	PCC	U18EE705	Electrical Simulation Laboratory	-	-	2	1	40	-	40	60	100
6	PCC	U18EE706	Power Systems Laboratory	-	-	2	1	40	-	40	60	100
7	PROJ	U18EE707	Major Project - Phase - I	-	-	6	3	100	-	100	-	100
8	MC	U18EE708	Internship Evaluation	-	-	2	-	100	-	100	-	100
Total				**12**	**-**	**12**	**17**	**320**	**120**	**440**	**360**	**800**
Additional Learning*:			*Maximum credits allowed for Honours/Minor*	-	-	-	*7*	-	-	-	-	-
			Total credits for Honours/Minor students:	**-**	**-**	**-**	***17+7***	**-**	**-**	**-**	**-**	**-**

** List of courses for additional learning through **MOOCs** towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

Note: L - Lectures; T – Tutorials; P – Practicals; CIE – Continuous Internal Evaluation; TA – Teachers Assessment; MSE – Mid Semester Examination; ESE – End Semester Examination;

Student Contact Hours/Week : 24

Total Credits(C) : 17

Open Elective-III

U18OE701A: Disaster Management

U18OE701B: Project Management

U18OE701C: Professional Ethics in Engineering

U18OE 701D: Rural Technology and Community Developments

Professional Elective-III/MOOC-III

U18EE702A: HVDC & FACTS

U18EE702B: Embedded Systems

U18EE702C: Micro grid & Distributed Generation

U18EE702M: MOOCs Course

Professional Elective-IV / MOOC-IV

U18EE703A: Computer Methods in Power Systems

U18EE703B: Power Quality

U18EE703C: Power System Deregulation

U18EE703M: MOOCs Course

U18OE701A DISASTER MANAGEMENT

Class: B.Tech., VII-Semester

Branch: CE, EIE, EEE, ECE & ECI

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on

LO1: disaster types, its impacts & national policy on disaster management

LO2: prevention, preparedness and mitigation measures for different disasters, emergency support functions and relief camps

LO3: different types of vulnerability, macroeconomic, financial management of disaster and its related losses

LO4: disaster management for infrastructure, treatment of plants, geo spatial information in agriculture, multimedia technology in disaster risk management and training

UNIT – I (9)

Introduction & Principles of Disaster Management: Nature - Development, Hazards and disasters; Natural disasters - Earth quakes, Floods, Fire, Landslides, Cyclones, Tsunamis, Nuclear; Chemical dimensions and Typology of disasters - Public health disasters, National policy on disaster management

UNIT –II (9)

Prevention Preparedness and Mitigation Measures: Prevention, Preparedness & mitigation measures for various disasters, Post disaster reliefs and logistics management, Emergency support functions and their coordination mechanism, Resources and material management, Management of relief camp

UNIT– III (9)

Risk and Vulnerability: Building codes and land use planning, Social vulnerability, Environmental vulnerability, Macroeconomic management and sustainable development, Climate change, Risk rendition, Financial management of disaster and related losses

UNIT - IV (9)

Role of Technology in Disaster Management: Disaster Management for infrastructures, Taxonomy of infrastructure, Treatment plants and process facilities, Electrical sub stations, Roads and Bridges, Geo spatial information in agriculture, Drought assessment, Multimedia technology in disaster risk management and training

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Textbook:

[1] Rajib shah and R.R Krishnamurthy, *Disaster management – Global Challenges and local solutions,* Hyderabad: Universities Press (India) Pvt. Ltd., 2009.

Reference Book:

[1] Satish Modh, *Introduction to Disaster management,* Bengaluru: Macmillan India Ltd., 2010.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: classify the disasters and discuss natural & non-natural disasters, their implications, the institutional & legal framework for national policy on disaster management in India

CO2: identify mitigation strategies, preparedness & prevention measures and prioritizes the rescue & relief operations to reduce the impact of a disaster

CO3: list the vulnerable groups in disaster; examine the concepts of macroeconomic & sustainability & impact of disaster on development

CO4: discuss disaster management for infrastructure, utilize geospatial information in agriculture and apply multimedia technology for disaster risk management & training

Course Articulation Matrix (CAM): U18OE701A DISASTER MANAGEMENT

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE701A.1	-	-	-	-	-	2	2	1	-	-	1	1	-	-
CO2	U18OE701A.2	-	-	-	-	-	2	2	1	-	-	1	1	-	-
CO3	U18OE701A.3	-	-	-	-	-	2	2	1	-	-	1	1	-	-
CO4	U18OE701A.4	-	-	-	-	-	2	2	1	-	-	1	1	-	-
U18OE701A		**-**	**-**	-	-	-	**2**	**2**	**1**	**-**	**-**	**1**	**1**	**-**	-

U18OE701B PROJECT MANAGEMENT

Class: B.Tech., VII-Semester

Branch: CE, EIE, EEE, ECE & ECI

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…

LO1: role of project manager, organization and management functions
LO2: effective time &conflict management, ethics & professional responsibilities
LO3: project planning, scheduling and budgeting
LO4: cost control, risk management and quality control techniques

UNIT – I (9)

Project Management: Understanding project management, role of project manager, classification of projects, project management growth, definitions and concepts, organizational structures - organizing and staffing the project management office and team; management functions

UNIT – II (9)

Time and Conflict Management: Understanding time management, time management forms, effective time management, stress and burnout, conflict environment, conflict resolution, management of conflicts, performance measurement, financial compensation and rewards, morality, ethics, corporate culture, professional responsibilities, success variables, working with executives

UNIT – III (9)

Project planning: General planning, life-cycle phases, proposal preparation, project planning, the statement of work, project specifications, milestone schedules, work breakdown structure, executive role in planning, the planning cycle, handling project phase outs and transfers, stopping projects, scheduling techniques - CPM and PERT, pricing and estimating

UNIT – IV (9)

Cost and quality control: Understanding cost control, Earned Value Measurement System, cost control problems, methodology for trade-off analysis, risk management process, risk analysis, risk responses, monitoring and control of risks, contract management, quality management concepts, cost of quality, quality control techniques

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Textbook:

[1] Harold Kerzner, *Project Management: A Systems Approach to Planning, Scheduling and Controlling*, 10th ed. Hoboken, NJ: John Wiley & Sons Inc., 2009.

Reference Books:

[1] Jack R Meredith & Samuel J mantel Jr., *Project Management: A Managerial Approach*, 8th ed., Hoboken, NJ: John Wiley & Sons Inc., 2012.

[2] John M Nicholas & Herman Steyn, *Project Management for Business, Engineering and Technology*, 4th ed. Abingdon, UK: Taylor & Francis, 2012.

[3] Adedeji B. Badiru, *Project Management: Systems, Principles and Applications*, Florida, USA: CRC Press, 2012.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of the course, the student will be able to…

CO1: evaluate the desirable characteristics of effective project managers

CO2: plan to resolve issues in conflicting environments

CO3: apply appropriate approaches to plan a new project in-line with project schedule & suitable budget

CO4: estimate the risks to be encountered in a new project and apply appropriate techniques to assess & improve ongoing project performance

Course Articulation Matrix (CAM): U18OE701B PROJECT MANAGEMENT														
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	U18OE701B.1	-	-	-	-	-	1	-	-	-	1	1	-	-	-
CO2	U18OE701B.2	-	-	-	-	-	1	-	2	-	1	1	-	-	-
CO3	U18OE701B.3	1	1	-	-	-	1	-	-	-	1	1	-	-	-
CO4	U18OE701B.4	1	1	-	-	-	1	-	-	-	1	1	-	-	-
U18OE701B		**1**	**1**	**-**	**-**	**-**	**1**	**-**	**2**	**-**	**1**	**1**	**-**	-	-

U18OE701C PROFESSIONAL ETHICS IN ENGINEERING

Class: B.Tech., VII-Semester

Branch: CE, EIE, EEE, ECE & ECI

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students‟ knowledge in/on …

LO1: human values and engineering ethics
LO2: professionalism, theory of virtues and code of ethics
LO3: safety & risk benefit analysis, professional and intellectual property rights
LO4: environmental & computer ethics and various roles of engineers in a company

UNIT – I (9)

Human Values: Morals, values & ethics, integrity, work ethic, service learning, civic virtue, respect for others, living peacefully, caring, sharing, honesty, courage, valuing time, co- operation, commitment, empathy, self-confidence, character, spirituality

Engineering Ethics: Senses of "Engineering Ethics", variety of moral issues, types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory - consensus and controversy

UNIT – II (9)

Profession and professionalism: Profession and its attributes, models of professional roles **theory of virtues:** definition of virtue and theories of virtues, self-respect, responsibility and senses, modern theories of virtues, uses of ethical theories

Engineering as social experimentation: Engineering as experimentation, engineers as responsible experimenters, codes of ethics, a balanced outlook on law, the challenger case study

UNIT –III (9)

Safety, Responsibilities and Rights: Safety and risk, assessment of safety and risk, risk benefit analysis and reducing risk - three-mile island and Chernobyl case studies; collegiality and loyalty, respect for authority, collective bargaining, confidentiality, conflicts of interest, professional rights, employee rights, Intellectual Property Rights (IPR), discrimination

UNIT – IV (9)

Global Issues: Multinational corporations - Environmental ethics, computer ethics, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership, sample code of ethics (Specific to a particular engineering discipline)

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Textbook:

[1] D.R. Kiran, *Professional Ethics and Human Values*, New York: McGraw Hill, 2013.

Reference Books:

[1] Govindarajan. M, Natarajan. S, Senthil Kumar. V.S, *Professional Ethics and Human Values,* New Delhi: Prentice Hall of India, 2013.
[2] Mike Martin and Roland Schinzinger, *Ethics in Engineering*, 4th ed. New York: McGraw Hill, 2014.
[3] Charles D. Fleddermann, *Engineering Ethics*, 4th ed. New Delhi: Prentice Hall, 2004.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: identify the need for human values, morals & ethics and apply Gilligan's & Kohlberg's theories for morale development
CO2: identify the desired characteristics of a professional & the need for code of ethics & balanced outlook on law
CO3: estimate the safety margin & threshold level and describe the procedure for obtaining a patent
CO4: analyze the role of engineer in multinational companies as an advisor, consultant & manager

Course Articulation Matrix (CAM): U18OE701C PROFESSIONAL ETHICS IN ENGINEERING

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	U18OE701C.1	-	-	-	-	-	1	-	2	1	-	-	1	-	-
CO2	U18OE701C.2	-	-	-	-	-	1	-	2	1	-	-	1	-	-
CO3	U18OE701C.3	-	-	-	-	-	1	-	2	1	-	-	1	-	-
CO4	U18OE701C.4	-	-	-	-	-	1	-	2	1	-	-	1	-	-
U18OE701C		**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**1**	**-**	**-**	**1**	-	-

U18OE701D RURAL TECHNOLOGY AND COMMUNITY DEVELOPMENT

Class: B.Tech., VII-Semester **Branch:** CE, EIE, EEE, ECE & ECI

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students‟ knowledge in/on...

LO1: building technologies, modern agricultural implements and food processing methods

LO2: medicinal & aromatic plants to fulfill the needs of pharmaceutical industries and rural energy for eradication of drudgery

LO3: purification of drinking water, rain water harvesting and employment generating technologies in rural areas

LO4: objectives & characteristics of community development, need for community mobilization and approaches for community organization

UNIT – I (9)

Technologies and Process: Building materials and components - micro concrete roofing tiles, water & fire proof mud walls and thatch, red mud/rice husk cement, types of bricks, ferro-cement water tanks and other products, cement blocks, preservation of mud walls, agricultural implements - Naveen sickle, animal drawn digger, grubber weeder, self propelled reaper, seed drill, improved bakhar

Food Processing: Fruit and vegetable preservation - process flow sheet, scale of operation, economic feasibility, source of technology; soya milk - process, economics; dehydration of fruits and vegetables, cultivation of oyster mushroom - preparation of beds, spawning, removal of bags for production of mushrooms, harvesting and marketing, economics, process flow sheet, source of technology

UNIT – II (9)

Medicinal and Aromatic plants: Plants and its use, aromatic plants, Cymbopogons, Geranium, manufacturing of juice, gel and powder, rural energy - cultivation of jatrophacurcus and production of biodiesel, low-cost briquetted fuel, solar cookers and oven, solar drier, bio-mass gasifier

Bio-fertilizers: Introduction, Vermicompost, improvement over traditional technology/process, techno economics, cost of production, utilization of fly ash for wasteland development and agriculture

UNIT – III (9)

Purification of Drinking water: Slow sand filtration unit, iron removal plant connected to hand pump, chlorine tablets, pot chlorination of wells, solar still, fluoride removal, rain water harvesting through roof top, rain water harvesting through percolation tank, check dams, recharging of dug wells

Employment Generating Technologies: Detergent powder and cake - process, process for liquid detergent, carcass utilization - improvement over traditional technology, flow chart, process, capital investment; indigo blue - dye, organic plant production, dye extraction techniques, aspects of indigo

market, economics; modernization of bamboo based industries - process for bamboo mat making, Machinery, Products, Agarbatti manufacturing; vegetable tanning of leathers - raw material, soaking, Liming, Reliming, Deliming, Pretanning, Malani, setting, yield

UNIT – IV (9)

Community Development: Community organization - definition, need, functions, principles, stages; community development - definition, need, objectives, characteristics, elements, indicators; differences between community organization and community development

Community Mobilization: Need, benefits, preparing, initial contact with community, coordinating, functions of the community, challenges, techniques for mobilizing community, community contributions, leadership and capacity building, community participation, role of community worker in community mobilization, models of community organization practice - local development model, social planning model, social action model, approaches to community organization

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Textbooks:

[1] M.S. Virdi, *Sustainable Rural Technology*, New Delhi: Daya Publishing House, 2009.

[2] Asha Ramagonda Patil, *Community Organization and Development: An Indian Perspective*,New Delhi: Prentice Hall of India, 2013.

Reference Books:

[1] Punia Rd Roy, *Rural Technology*, New Delhi: Satya Prakashan Publishers, 2009.

[2] S.B. Verma, S.K. Jiloka, Kannaki Das, *Rural Education and Technology*, New Delhi: Deep& Deep Publications Pvt. Ltd., 2006.

[3] Edwards, Allen David and Dorothy G.Jones, *Community and Community Development*,The Hague, Netherlands: Mouton, 1976.

[4] Lean, Mary, *Bread, Bricks and Belief: Communities in Charge of Their Future*, WestHartford, US: Kumarian Press, 1995.

[5] Heskin, Allen David, *The Struggle for Community*, Colorado, US: West View Press, 1991

[6] Clinard, Marshall Barron, *Slums and Community Development: Experiments in Self- Help*,Mumbai: Free Press, 1970.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: discuss various building technologies, modern agricultural implements and food processing methods which can be implemented in rural areas

CO2: identify major medicinal plants that are required for pharmaceutical companies & alternative fuel that meets substantial oil need in the country and the need and usage of bio- fertilizers

CO3: analyze several cost effective technologies for purification of water, rain water harvesting techniques for collection & storage of rain water and examine the employment generating technologies in tribal/ rural areas

CO4: distinguish between community organization and community development and identify techniques for community mobilization & approaches to community organization for social change

Course Articulation Matrix (CAM): U18OE701D RURAL TECHNOLOGY AND COMMUNITY DEVELOPMENT														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18OE701D.1	-	-	1	-	-	1	2	-	-	-	-	1	-	-
CO2	U18OE701D.2	-	-	1	-	-	1	2	-	-	-	-	1	-	-
CO3	U18OE701D.3	-	-	1	-	-	1	2	-	-	-	-	1	-	-
CO4	U18OE701D.4	-	-	-	-	-	1	2	-	-	-	-	-	-	-
U18OE701D		**-**	**-**	**1**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**1**	-	-

U18EE702A HVDC & FACTS

Class: B.Tech., VII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: differences between HVDC & HVAC transmission and operation of Graetz circuit
LO2: converter control techniques and types of harmonics
LO3: controllable parameters and shunt compensators
LO4: series compensation and UPFC

UNIT – I (9)

DC Power Transmission: Need for power system interconnections, comparison of HVDC and HVAC transmission systems, types of DC links and components

Analysis of converters: Analysis of Graetz circuit with and without overlap, voltage waveforms, analysis of two and three valve conduction mode, converter bridge characteristics, inverter mode of operation

UNIT – II (9)

Principles of DC link control: Converter control characteristics, control hierarchy, constant current control, CEA control, firing angle control of valves, starting and stopping of a DC link, power control, sources of harmonic generation, types of filters

UNIT – III (9)

Introduction to FACTS controllers: Relative importance of controllable parameters, basic types of FACTS controllers

Shunt compensation: Objectives of shunt compensation, methods of controllable VAR generation, TCR, TSC, FC-TCR configurations, STATCOM, basic operating principle, application of STATCOM for reactive power control

UNIT – IV (9)

Series compensation: Objectives of series compensator, sub synchronous resonance variable impedance type of series compensators, TCSC, TSSC-operating principles and control schemes, SSSC, power angle characteristics, application of SSSC for voltage stability

UPFC: Introduction, basic operating principle, independent control of real and reactive power

Applications of HVDC transmission and FACTS controllers in Indian power sector

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Textbooks:

[1] S. Kamakshaiah, V. Kamaraju, *HVDC Transmission*, 2nd edn., New Delhi: McGraw Hill (India) Private Limited, 2020.

[2] Narain. G. Hingorani, Laszlo Gyugyi, *Understanding FACTS –Concepts and Technology of Flexible AC Transmission Systems*, New Jersey: Wiley-IEEE press, 1999.

Reference books:

[1] K. R. Padiyar, *HVDC Power Transmission Systems*, 3rd ed., New Delhi: New Age International (P) Ltd., 2017.
[2] R. Mohan Mathur, Rajiv K. Varma, *Thyristor-Based FACTS Controllers for Electrical Transmission Systems*, New Jersey: Wiley-IEEE press, 2002.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes:

After completion of this laboratory course, students will be able to

CO1: analyze HVDC & EHVAC transmission and Graetz circuit
CO2: apply suitable control techniques for effective operation of DC link
CO3: analyze the operation of shunt controllers and identify suitable shunt controller for a given application
CO4: analyze the operation of series controllers & UPFC and select a suitable FACTS controller for a given application

Course Articulation Matrix : U18EE702A HVDC & FACTS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**U18EE702A.1**	2	1	1	1	-	-	-	-	1	1	-	1	2	1
CO2	**U18EE702A.2**	2	1	1	1		-	-	-	1	1	-	1	2	1
CO3	**U18EE702A.3**	2	1	1	1		-	-	-	1	1	-	1	2	1
CO4	**U18EE702A.4**	2	1	1	1		-	-	-	1	1	-	1	2	1
U18EE702A		**2**	**1**	**1**	**1**		-	-	-	**1**	**1**	-	**1**	**2**	**1**

U18EE702B EMBEDDED SYSTEMS

Class: B.Tech., VII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objective:

This course will develop students' knowledge in/on

LO5: concepts of embedded systems
LO6: general purpose and domain specific processors
LO7: embedded firmware design approaches and programming in embedded C for 8051 and PIC microcontroller
LO8: RTOS & its applications

UNIT – I (9)

Introduction to Embedded Systems: Definition of embedded system, embedded systems vs general computing systems, history of embedded systems

Classification and Characteristics of Embedded Systems: Classification, major application areas, purpose of embedded systems, characteristics and quality attributes of embedded systems

UNIT – II (9)

Typical Embedded System: Core of the Embedded system: general purpose and domain specific processors, application specific integrated circuits (ASICs), Programmable logic designs (PLDs)

Memory: ROM, RAM, Memory according to the type of interface, memory shadowing, memory selection for embedded systems, sensors and actuators

UNIT – III (9)

Embedded Firmware: Reset circuit, Brown-out protection circuit, oscillator unit, real time clock, watchdog timer, embedded firmware design approaches and development languages

Programming in Embedded C: Programming in Embedded C for 8051 microcontroller, PIC programming in Assembly & C languages

UNIT – IV (9)

RTOS Based Embedded System Design: Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling, device drivers, how to choose an RTOS

Applications of RTOS: RTOS for detection and classification of power quality disturbances in the context of home energy management systems, RTOS for analysis of power dissipation in embedded systems, RTOS for IoT Devices

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Textbooks:

[1]. Shibu K.V, *Introduction to Embedded Systems*, New Delhi: McGraw Hill (India) Private Limited, 2014 (Unit I, II, III & IV)

[2]. Mazidi M.A, Mazidi J.G, McKinlay R.D, *The 8051 Microcontroller and Embedded Systems Using Assembly and C*, New Delhi: Pearson Education, 2006 (Unit III)

[3]. Mazidi M.A, Mckinlay R.D, Causey D, *PIC Microcontroller and Embedded systems using Assembly and C for PIC 18*, New Delhi: Pearson Education, 2008 (Unit III)

Reference Books:

[1]. Raj Kamal, *Embedded Systems*, 2nd ed., New Delhi: McGraw Hill (India) Private Limited, 2008.

[2]. Lyla, *Embedded Systems-An Integrated Approach*, New Delhi: Pearson Education, 2013.

[3]. David E. Simon, *An Embedded Software Primer*, New Delhi: Pearson Education, 2004.

[4]. Kenneth Ayala, *The 8051 Microcontroller & Embedded Systems Using Assembly and C*, Cengage Learning, 2010

Reference articles:

[1] Rodrigues Junior WL, Borges FAS, Rabelo RdAL, Rodrigues JJPC, Fernandes RAS, da Silva, *A methodology for detection and classification of power quality disturbances using a real-time operating system in the context of home energy management systems*, International Journal of Energy Res., 2020;1–17. https://doi.org/10.1002/er.5183 (Unit IV)

[2] Dick RP, Lakshminarayana G, Raghunathan A, Jha NK., *Analysis of power dissipation in embedded systems using real-time operating systems*, IEEE Transactions on computer-aided design of integrated circuits and systems. 2003;22,5. https://doi.org/10.1109/TCAD.2003.810745 (Unit IV)

[3] Hahm S, Kim J, Jeong A, Yi H, Chang S, Kishore SN, Chauhan A, Cherian SP., *Reliable Real-Time Operating System for IoT Devices*, IEEE Internet of Things J. 2021;8,5. https://doi.org/10.1109/JIOT.2020.3025612 (Unit IV)

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: compare the performance of embedded systems with general purpose systems and identify the major application areas of embedded systems

CO2: describe general purpose and domain specific processors

CO3: compare embedded firmware design approaches and write programs in embedded C for 8051 and PIC microcontroller

CO4: identify the areas where RTOS can be applied in home energy management systems, embedded systems & IoT devices

Course Articulation Matrix: U18EE702B EMBEDDED SYSTEMS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE702B.1	2	2	1	2	2	-	-	-	1	1	1	2	1	1
CO2	U18EE702B.2	2	2	2	2	2	-	-	-	1	1	1	1	1	1
CO3	U18EE702B.3	2	2	2	2	2	-	-	-	1	1	1	2	1	1
CO4	U18EE702B.4	2	2	2	2	2	-	-	-	1	1	1	1	2	2
U18EE702B		**2**	**2**	**1.75**	**2**	**2**	-	-	-	1	**1**	**1**	**1.5**	**1.25**	**1.25**

U18EE702C MICRO GRID & DISTRIBUTED GENERATION

Class: B.Tech., VII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on

LO5: microgrid classification and its operation
LO6: different distributed generation sources and their importance
LO7: controlling aspects of microgrid
LO8: microgrid protection schemes

UNIT-I (9)

Introduction to Microgrid: Definition, microgrid structure, distribution network dispatch layer and centralized control layer, local control layer, operation modes of micro grid, grid connected operation, islanded operation, control modes of micro grid, inverter control modes, classification of micro grids by capacity and by AC/DC type

UNIT-II (9)

Distributed Generation (DG): Definition, need, types of DGs, modelling of solar Photo Voltaic (PV) systems, Wind Energy Conversion Systems (WECS) and small hydro power plants (SHP), distributed generation challenges and opportunities in India

UNIT-III (9)

Control and operation of microgrid: Three-state control of independent microgrid, steady state constant frequency and constant voltage control**,** dynamic generator tripping and load shedding control, transient fault protection, inverter control, grid connection and separation control, conditions for grid connection, grid connection logic, grid connected operation of microgrid, islanded operation of microgrid

UNIT-IV (9)

Protection of the microgrid: Special fault characteristics of DG, effects of microgrid on relay, protection of a traditional distribution network, protection of a traditional LV distribution network, impacts of microgrid on relay protection of distribution network, impacts of a microgrid on protection of traditional LV distribution lines microgrid operation and protection strategies, protection scheme for distribution network connected with a microgrid, differential relay protection of the distribution network

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Textbooks:

[1] Li Fusheng, Li Ruisheng and Zhou Fengquan, *Microgrid Technology and Engineering Application,* Cambridge: Elsevier Academic Press, 2015. (Unit I,II, III, IV)

[2] H. Lee Willis, Walter G. Scott, *Distributed Power Generation – Planning and Evaluation*, UK: CRC press, 2000. (Unit II)

Reference books:

[1] Nikos Hatziargyriou "Microgrids: Architectures and Control" ISBN:978-1-118-72068-4, Wiley- IEEE Press, 2014.

[2] Stephen peake "*Renewable Energy power For sustainable future*", Oxford University Press, 4th edition 2018.

[3] N.B.Klinghoffer, N.J.Themelis and M.J.Castaldi "Waste to energy (WTE): an introduction" Sciencedirect, pp 3-14, 2013.

[4] Ravindra kumar Yadav; R.P. Singh "Recent Challenges and Opportunities of Electrical Generation and Distribution in Rural Area of India" IEEE International Conference on Current Trends towards Converging Technologies (ICCTCT), 2018.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: analyze operation of microgrid in grid connected and islanded modes
CO2: select the DG technology for a given application
CO3: analyze the modes of the independent and inverter control for microgrid operation
CO4: analyze the protection schemes of microgrid in a distribution network

Course Articulation Matrix : U18EE702C MICROGRID & DISTRIBUTED GENERATION														
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE702C.1	2	1	1	1	-	-	-	-	1	1	-	1	2	1
CO2	U18EE702C.2	2	1	-	-	1	-	-	-	1	1	-	1	2	1
CO3	U18EE702C.3	2	1	1	1	1	-	-	-	1	1	-	1	2	1
CO4	U18EE702C.4	2	1	2	1	1	-	-	-	1	1	-	1	2	1
U18EE702C		**2**	**1**	**1**	**0.75**	**0.75**	-	-	-	1	1	**-**	**1**	**2**	**1**

U18EE703A COMPUTER METHODS IN POWER SYSTEMS

Class: B.Tech., VII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on

LO1: computation of bus impedance (Zbus) and bus admittance (Ybus) matrices
LO2: analysis of faults in power system
LO3: transient stability of power system
LO4: applications of state estimation in power system

UNIT – I (09)

Network Modeling: Introduction, graphs, incidence matrices, primitive network and matrices, types of network matrices, Y_{bus} by singular transformation, step by step algorithm for formation of Z_{bus}, modification of Z_{bus} matrix for changes in the network

UNIT – II (09)

Short Circuit Studies: Introduction, physical assumptions, three phase balanced networks and faults, symmetrical components, fault analysis in phase impedance form, general fault representation in phase quantities, symmetrical component analysis, short circuit calculations for balanced networks using Z_{bus}

UNIT – III (09)

Transient Stability Analysis: Representation of synchronous machines, modeling of transmission networks and load, swing equation, solution of swing equation by numerical methods: modified Euler's method, Runge-Kutta fourth order method

UNIT – IV (09)

State Estimation in Power Systems: Introduction, power system state estimation, maximum likelihood concept, weighted least squares estimation, matrix formulation, state estimation of an AC network, state estimation by orthogonal decomposition, detection and identification of bad measurements, estimation of quantities not being measured, network observability and pseudo measurements

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Textbooks:

[1] Stagg and E.L.Abaid, *Computer methods in Power systems* New Delhi: McGraw Hill (India) Private Limited, 1968
[2] A.J. Wood and B.F. Wollenberg, *Power Generation Operation and Control*, 2nd ed., New Jersey: John Wiley & Sons, 1996

Reference Books:

[1] K. Uma Rao, *Computer Techniques and Models in Power Systems*,2nd ed.,New Delhi: I.K. International Publishers, 2014.
[2] M.A. Pai, *Computer Techniques in Power system analysis,* New Delhi: Tata McGraw-Hill, 2/e ,2006.
[3] Ali Abur, *Power System State Estimation: Theory and Implementation*, UK: CRC press, 2004.
[4] A. Monticelli, *State estimation in electric power systems*, Germany: Springer Science, 2012.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to

CO1: compute bus impedance (Y_{bus}) and bus admittance (Z_{bus}) matrices of given power system network

CO2: compute short circuit fault current for the given power system network during dynamic network changes

CO3: determine the transient stability of SMIB system using numerical techniques

CO4: apply Weighted least square estimation method to determine the state of the power system network

Course Articulation Matrix: U18EE703A COMPUTER METHODS IN POWER SYSTEMS														
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE703A1	2	1	1	1	1	-	-	-	1	1	1	1	2	1
CO2	U18EE703A.2	2	1	1	1	1	-	-	-	1	1	1	1	2	1
CO3	U18EE703A.3	2	1	1	1	-	-	-	-	1	1	1	1	2	1
CO4	U18EE703A.4	2	1	1	1	-	-	-	-	1	1	1	1	2	1
U18EE703A		**2**	**1**	**1**	**1**	**1**	**-**	**-**	**-**	1	1	1	**1**	**2**	**1**

U18EE703B POWER QUALITY

Class: B.Tech., VII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: power quality problems in distribution systems
LO2: voltage interruptions & voltage sags
LO3: harmonic phenomena, sources of harmonics & effects
LO4: mitigation methods for voltage interruptions & sags

UNIT – I(9)

Introduction to Power Quality issues: Overview, concept and definition of power quality (PQ), electric power quality phenomena, Sources of power pollution, International power quality regulations, CBEMA and ITI curves, power quality disturbances: voltage fluctuations, transients, unbalance waveform distortion, power frequency variations

Power quality terms: Voltage variations, voltage sags and short interruptions, sources of sags and interruptions, rapid voltage fluctuations, flicker, short duration outages, longer duration variations, voltage dips and voltage swells, voltage unbalance, sources, range and impact on sensitive circuits, Waveform distortion

Standards on Power Quality: Introduction to standardization, IEEE std. 519 & 1159 and IEC std. 61000-4-30 on power quality

UNIT – II (9)

Long and Short Interruptions: Introduction, causes of long and short interruptions, limits for interruption frequency and duration, overview of reliability evaluation, cost of interruptions, effect of interruption on equipment, stochastic prediction of short interruptions

Voltage Sags and its Characterization: Introduction, voltage sag magnitude and duration, three- phase unbalance, phase-angle jumps, magnitude and phase-angle jumps for three-phase unbalanced sags, load influence on voltage sags, equipment behaviour of power electronic loads, induction motors, synchronous motors, computers, consumer electronics, adjustable speed AC & DC drives

UNIT – III (9)

Waveform Distortion: Introduction, Voltage versus current distortion, harmonics versus transients, harmonic indices: Total Harmonics Distortion (THD) and Total Demand distortion (TDD), SAIFI, SAIDI, CAIDI; harmonic standards, harmonic analysis, harmonic phase sequence, triplen harmonics, inter harmonics

Harmonic Sources: Introduction, harmonics generated from electrical machines such as transformers and rotating machines, arcing devices, static power conversion: phase controlled and uncontrolled rectifiers, AC voltage regulators, cyclo-converters, pulse width modulated inverters; converter fed AC and DC drives

Effects of Harmonic Distortion: Resonances, effects of harmonics on rotating machines, effect of harmonics on static power plant, power assessment with distorted waveforms, effect of harmonics on

measuring instruments, harmonic interference with ripple control systems, harmonic interference with power system protection, effect of harmonics on consumer equipment, interference with communication systems

UNIT – IV (9)

Mitigation of power quality issues: Overview of mitigation methods, power system design— redundancy through switching, the system-equipment interface: voltage-source converter, series and shunt voltage controllers: DVR, DSTATCOM, combined shunt and series controllers: Unified Power Quality Conditioner (UPQC); three-phase three-wire UPQC and three-phase four-wire UPQC topologies

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Textbooks:

[1]. Math H. J. Bollen, Understanding Power Quality Problems, Sweden: Wiley-IEEE Press, 2000. (Units-I,II).

[2]. Arindam Ghosh, Gerard Ledwich, Power Quality Enhancement Using Custom Power Devices, 2nd ed., New York: Springer, 2012. (Units-III, IV).

Reference Books / Articles:

[1]. Roger C. Dugan, Mark F. McGranaghan, Surya Santoso, H. Wayne Beaty, Electrical Power Systems Quality, 3rd ed., USA: McGraw Hill Professional, 2012.

[2]. Simmi P Burman and Bipin Singh, Power Quality, 1st ed., New Delhi: S.K. Kataria & Sons, 2012.

[3]. S.Chattopadhay, Madhuchanda Mitra, Electric Power Quality, 1st ed., New York: Springer Verlag Gmbh, 2011.

[4]. Bhim Singh, Ambrish Chandra, Kamal Al-Haddad, Power Quality problems and Mitigation Techniques, 1st ed., New Delhi: Wiley India Pvt. Ltd., 2015.

[5]. Jos Arrillaga, Neville R. Watson, S. Chen, Power System Quality Assessment, 2nd ed., New Zealand: John Wiley Publishing House, 2000.

[6]. IEEE Standards 519 & 1159 on Power Quality, USA.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: identify the various power quality problems

CO2: quantify voltage sags and suggest methods to reduce voltage interruptions

CO3: analyze the harmonic distortions & assess their effects on the behaviour of loads

CO4: *suggest methods to mitigate voltage interruptions & sags*

Course Articulation Matrix: U18EE703B POWER QUALITY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE703B.1	1	1	-	-	-	1	-	-	1	1	-	-	1	1
CO2	U18EE703B.2	1	2	-	-	-	1	-	-	1	1	-	-	1	1
CO3	U18EE703B.3	1	2	-	1	-	1	-	-	1	1	-	-	1	1
CO4	U18EE703B.4	1	1	1	-	-	1	-	-	1	1	-	-	1	1
U18EE703B		**1**	**1.5**	**1**	**1**	**-**	**1**		**-**	**1**	**1**	**-**	**-**	**1**	**1**

U18EE703C POWER SYSTEM DEREGULATION

Class: B.Tech., VII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: developments in power system restructuring
LO2: power system operation in competitive environment and ATC computation
LO3: electricity pricing
LO4: restructuring of Indian power sector

UNIT – I (9)

Overview of Key Issues in Electric Utilities: Introduction, restructuring models, Independent System Operator (ISO), power exchange, market operations, market power

UNIT – II (9)

Power System Operation in a Competitive Environment: Introduction, operational planning activities of ISO in pool markets and bilateral markets, operational planning activities of generation units (GENCO) in pool and bilateral markets

Available Transfer Capability (ATC): Definition, issues, calculation of ATC

UNIT – III (9)

Electricity Pricing: Introduction, electricity price volatility electricity price indexes, challenges to electricity pricing, forward price curves, short-time price forecasting

Transmission Open Access and Pricing: Power wheeling, types of transmission services in open access, cost components in transmission.

UNIT – IV (9)

Indian Power Sector: Evolution of Indian power sector, Salient features of Electricity Act 2003, Structure of Indian Electricity sector, functions of electricity regulators in India, role of RLDC, SLDC, RPC, CTU, CEA, STU, transmission open access, Indian Power Exchange (IEX)

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Textbooks:

[1]. Mohammad Shahidehpour, and Muwaffaq Alomoush, *Restructured Electrical Power systems*, United States: CRC Press, 2001. (Chapters I, VII)

[2]. Kankar Bhattacharya, Math H.J. Boller, Jaap E.Daalder, *Operation of Restructured Power System*, United States :Kluwer Academic Publisher, 2001. (Chapters III, IV)

[3]. Pratik Biswas, Sukanya Mandal, *Indian Electricity Sector under regulatory regime*, Kolkata: White Falcon Publishing, 2019. (Chapters II, IV, V)

Reference Books:

[1]. P. Venkatesh, B. V. Manikandan, S. Charles Raja, A. Srinivasan, *Electrical Power Systems: Analysis, Security and Deregulation*, New Delhi: PHI Learning Pvt. Ltd., 2012.

[2]. Loi Lei Lai (Ed), *Power System Restructuring and Deregulation: Trading, performance and Information Technology*, United States: John Wiley publications, 2001.

[3]. Fred I Denny and David E. Dismukes, *Power System Operations and Electricity Markets*, United States: CRC

Press, 2002

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: compare the performance of pool, bilateral & hybrid models of restructured power markets and propose suitable models for restructuring of electric markets

CO2: analyze the activities of ISO & GENCO in deregulated electricity markets and compute ATC

CO3: identify the challenges involved in electricity pricing and predict the electricity forward curves based on given electricity market conditions

CO4: analyze the impact of EA 2003 on Indian electricity sector

Course Articulation Matrix: U18EE703C POWER SYSTEM DEREGULATION

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE703C.1	2	1	-	1	-	-	-	-	1	1	-	1	2	1
CO2	U18EE703C.2	2	1	1	1	-	-	-	-	1	1	-	1	2	1
CO3	U18EE703C.3	2	1	1	-	-	-	-	-	1	1	-	1	2	1
CO4	U18EE703C.4	2	1	-	1	-	-	-	-	1	1	-	1	2	-
U18EE703C		**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**2**	**1**

U18EE704 POWER SYSTEM PROTECTION

Class: B.Tech., VII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on

LO1: circuit breakers
LO2: electromagnetic relays
LO3: static relays and numerical relays
LO4: protection of transmission lines

UNIT – I (9)

Introduction to switch gear: Introduction, principle of circuit interruption, short circuit studies in power systems, circuit breakers, types and characteristics, circuit breaker rating, restriking voltage, transient, characteristics of restriking voltage, circuit breaker operating mechanism

Types of circuit breakers: Air-break, oil circuit breakers, air-blast circuit breaker, vacuum circuit breakers, SF_6 circuit breakers modification of circuit breaker duty by shunt resistors, HVDC circuit breaking, design of circuit breakers, testing of circuit breakers, H.R.C. fuses, applications

UNIT – II (9)

Introduction to protection relays: Basic ideas of relay protection, need for protection relaying in power systems,Basic requirements of protective relaying, principles and characteristics of protective relaying

Classification of relays: Theory of application of relays, principal types of electromagnetic relays,theory of induction relay torque, over current relays, instantaneous over current relay, directional relays, distance relays, differential relay

UNIT – III (9)

Static relays: Basis for Static relay development, classification of static relays, basic componentsof static relays, Over current relay, differential protection and static distance protection

Numerical relays: Introduction to numerical relays, features of numerical relays, numerical relay issues

UNIT-IV (9)

Protection of transmission lines: Protection of transmission line with distance relays, effect of arc resistance, effect of power swings, over current and differential relays, unit protection of transmission, bus protection

Protection of generator and transformer: Generator protection with differential relays, earth fault relays. transformer protection with differential relays, earth fault relays, Buchholz relay

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Textbooks:

[1] Badhri Ram, D. N. Vishwakarma, *Power System Protection And Switchgear*, 2nd ed., New Delhi: McGraw Hill (India) Private Limited,2011.

[2] B. Ravindranath , M. Chander, *Power System Protection and Switchgear*, 2nd ed., New Delhi: New Age International (P) Ltd., 2011

Reference Books:

[1] Sunil S. Rao, *Switchgear Protection and Power Systems*, 14th ed., New Delhi: Khanna Publishers, 2019.

[2] U. A. Bakshi, M. V. Bakshi, *Switchgear and Protection*, Pune: Technical Publications, 2014.

[3] Y. G. Paithankar & S. R. Bhinde, *Fundamentals of Power System Protection*, 2nd ed., New Delhi: PHI Learning Pvt. Ltd., 2014.

[4] T.S Madhava Rao, *Power Systems Protection: Static Relays*, New Delhi: McGraw Hill (India) Private Limited, 2014.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: analyze fundamental principles of circuit breakers & fuses and identify suitable relay for a given application
CO2: analyze the operation of electromagnetic relays
CO3: analyze the operation of static relays & features of numerical relays
CO4: apply suitable protection scheme for protection of transmission lines, generators & transformers

Course Articulation Matrix : U18EE704 POWER SYSTEM PROTECTION

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE704.1	2	1	1	-	-	-	-	-	1	1	-	1	2	1
CO2	U18EE704.2	2	1	1	-	-	-	-	-	1	1	-	1	2	1
CO3	U18EE704.3	2	1	1	-	-	-	-	-	1	1	-	1	2	1
CO4	U18EE704.4	2	1	1	-	-	-	-	-	1	1	-	1	2	1
U18EE704		**2**	**1**	**1**	**-**	-	-	-	**-**	1	1	-	1	**2**	**1**

U18EE705 ELECTRICAL SIMULATION LABORATORY

Class: B.Tech., VII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in/on

LO1: simulate of power electronics converters & renewable energy systems using PSIM

LO2: solving power system problems using MATLAB

LO3: solving power system problems using MI-power

LO4: evaluating performance of power electronic converters using PSCAD & ATC calculations using PWS

LIST OF EXPERIMENTS

1. Simulation of three phase converter circuits using PSIM.
2. Simulation of solar energy system using PSIM.
3. Simulation of wind energy system using PSIM.
4. Performance evaluation of medium and long transmission lines using MATLAB
5. Symmetrical component analysis using MATLAB
6. Load frequency control of single area and two area power system(uncontrolled and controlled)with MATLAB Simulink
7. Newton Raphson method of load flow analysis using MI Power
8. Short circuit analysis using MI Power.
9. Relay coordination using MI Power.
10. Performance of FC-TCR compensator using PSCAD.
11. Performance of AC voltage controller circuit using PSCAD
12. Available Transfer Capability (ATC) calculations using Powerworld simulator

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Laboratory Manual:

[1] *Electrical Simulation Laboratory Manual*, Department of EEE, KITSW

Reference Books:

[1] C.L. Wadhwa, *Electrical Power Systems*,7th ed., New Delhi: New Age International Pvt. Ltd., 2016.

[2] I.J. Nagrath & D.P. Kothari, Modern *power system Analysis*, 4th ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2012.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

After completion of this course, students will be able to

CO1: simulate and analyze power electronics converters & renewable energy systems using PSIM

CO2: evaluate performance of transmission lines, load frequency control, and determine sequence components using MATLAB

CO3: develop simulation models for load flow analysis, short circuit analysis & relay coordination using MI-power

CO4: evaluate the performance of FC-TCR, AC voltage controller using PSCAD & ATC calculations using Powerworld simulator

Course Articulation Matrix: U18EE705 ELECTRICAL SIMULATION LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE705.1	2	1	1	-	2	-	-	1	2	2	-	1	2	1
CO2	U18EE705.2	2	1	1	-	2	-	-	1	2	2	-	1	2	1
CO3	U18EE705.3	2	1	1	-	2	-	-	1	2	2	-	1	2	1
CO4	U18EE705.4	2	1	1	-	2	-	-	1	2	2	-	1	2	1
U18EE705		2	1	1	-	2	-	-	1	2	2	-	1	2	1

U18EE706 POWER SYSTEMS LABORATORY

Class: B.Tech., VII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This laboratory course will develop students' knowledge in/on

LO1: performance of long transmission lines and measurement of breakdown strength of transformer oil
LO2: characteristics of protective relays and sequence impedances of transformer
LO3: short circuit analysis & sequence reactances of alternator
LO4: characteristics of PV array & reactive power control using tap changing transformers

LIST OF EXPERMENTS

1. Determination of efficiency and voltage regulation of an artificial transmission line
2. Improvement of voltage profile of an artificial transmission line with reactive power injection
3. Determination of breakdown strength of transformer oil
4. Determination of operating characteristics of IDMT over current relay
5. Determination of operating characteristics of static differential relay
6. Determination of sequence impedances of three phase transformer
7. Determination of sequence reactances of an alternator
8. Determination of fault current and voltages of an unloaded alternator subjected to LG fault
9. Determination of fault current and voltages of an unloaded alternator subjected to LL fault
10. Determination of output voltage, current & power and plotting of I-V and P-V curves of series and parallel combinations of PV modules for different temperature and radiation levels
11. Determination of output voltage, current & power of PV module for different tilt angles and shading conditions and plotting of tilt – power output characteristics
12. Determination of distribution of reactive power between two parallel transformers by adjusting voltage magnitude ratios

Additional experiments:

13. Determination of voltage profile of IEEE 33-bus radial distribution system
14. Determination of load flows of Neyveli Thermal Power Station (NTPS)-23 bus test system

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Laboratory Manual:

[1]. *Power Systems Laboratory Manual*, Department of EEE, KITSW.

Reference Books:

1. C.L. Wadhwa, *Electrical Power Systems*,7th ed., New Delhi: New Age International Pvt. Ltd., 2016.
2. I.J. Nagrath & D.P. Kothari, Modern *power system Analysis*, 4th ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2012.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this laboratory course, the students will be able to…

CO1: determine the performance characteristics of a long transmission line & breakdown strength of transformer oil

CO2: determine the operating characteristics of protective relays & sequence impedances of transformer

CO3: determine the sequence components of alternator and the fault currents

CO4: determine the characteristics of PV arrays & reactive power distribution among parallel connected tap changing transformers

Course Articulation Matrix: U18EE706 POWER SYSTEMS LABORATORY														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18EE703C.1	2	2	-	2	-	-	-	1	2	2	-	1	2	2
CO2	U18EE703C.2	2	2	-	2	-	-	-	1	2	2	-	1	2	2
CO3	U18EE703C.3	2	2	-	2	-	-	-	1	2	2	-	1	2	2
CO4	U18EE703C.4	2	2	-	2	-	-	-	1	2	2	-	1	2	2
U18EE703C		**2**	**2**	**-**	**2**	**-**	**-**	**-**	**1**	**2**	**2**	**-**	**1**	**2**	**2**

U18EE707 MAJOR PROJECT WORK PHASE-I

Class: B.Tech., VII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	6	3

Examination Scheme:

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives (LOs):

The major project work will develop students' knowledge on /in…

LO1: *real-world complex engineering problems, literature review, problem formulation; and experimental and data analysis techniques*

LO2: *design/development of solutions to real-world engineering problems; conduct of investigations of complex problems; modern tool usage to design, build and test a prototype; impact of solution in society, environment and sustainability contexts*

LO3: *ethics, team work and project management skills such as budgeting, scheduling*

LO4: *oral, written and multimedia communication skills; self-directed independent learning and life-long learning*

1. Final Year Major Project work represents the culmination of study towards the B. Tech degree. ***Major project offers an opportunity to integrate the knowledge acquired from various courses and apply it to solve real-world complex engineering problems***. The **student learning assessment process** (SLAP) shall include good number of presentations, demonstration of work undertaken, submission of a project report, writing project paper in scientific journal style & format, preparing project poster and creating video pitch on the complete project work.
2. Activities of major project SLAP shall be planned in such a way to ensure that the students acquire the essential knowledge, skills and qualities (KSQ) of a professional engineer.
3. **Team work:** Major project work is a team work.
   (i) The students of a project team shall work together to achieve a common objective.
   (ii) Every student of a project team is expected to function effectively as an individual, and also with others as a team member in an ecosystem of team having knowledge diversity, gender diversity, social and cultural diversity among its members.
4. **Two phases:** Major project work shall be carried out in two phases. Nearly 50 - 75% of the proposed work to be completed in 7th semester as *Phase-I* and the remaining work to be continued and completed in 8th semester as *Phase-II.*
5. Every student is expected to put approximately **72 hours of work** into the major project *phase-I* course over the 12 weeks of 7th semester.
6. **Major project work *Phase-I*: 7th semester**
   (i) The HoD shall constitute the ***department project evaluation committee (DPEC)*** with following composition

Department project evaluation committee (DPEC)	
HoD	Chairman
Senior Faculty	Convener
Coordinator(s)	Section - wise coordinator(s) *One coordinator for each section*

Three Faculty members	Section-wise faculty members *Three faculty members for each section representing various socializations. (Five specializations will be covered including the coordinator's and Convener's)*

(ii) <u>Major project allotment to students during last working week of 6th semester:</u>

(a) **First / Second week of 6th Semester**: The process shall be initiated during the first / second week of 6th semester by collecting project titles from the department faculty research groups, on offering innovative ideas/solutions for engineering problems.

(b) **MSE-I period of 6th Semester – Notifying project titles**: The finalized project titles shall be notified to students during the MSE-I period of 6th semester and student teams shall be allowed to exercise their options on titles that interest them.

(c) **Last working week of 6th Semester – Allotment of titles and supervisors to project teams**: The project title allotment to major project teams shall be completed before the last day of instruction of 6th semester

(d) **6th semester summer break - Literature review**: This 6th semester schedule enables students to complete literature review, preliminary simulations / investigations / experimentation during 6th semester summer break and *start the work from day-one in 7th semester*

(e) **Registration Presentation - Notifying the tentative dates:** The major project teams are expected to give registration presentation during second / third week from the commencement of 7th semester. The tentative dates for conducting the registration presentation shall be notified at the time of releasing the circular on allotted project title and project supervisors, as indicated in (c) above. This enables student teams to plan the work accordingly during summer break, to complete the literature review, preliminary simulations / investigations and get ready for informative, confident and comfortable presentations on their project work.

(iii) The convener DPEC shall notify, during MSE-I period of 6th semester, the list of implementable project titles offered by the faculty of different research groups of the department

(a) Project titles shall come with the following details to be made available to students on dept webpage and notice boards, facilitating students to select problems that interest them.

i. abstract
ii. deliverables / outcomes
iii. knowledge and skills required to complete the project
iv. resources required
v. one of the deliverables shall be writing a technical paper out of the major project work done for submission to a reputed non-predatory conference/non-paid peer reviewed journal

(iv) The major project teams, finalized by the convener DPEC, shall be allowed to exercise their options on the titles that interest them from the notified list

(v) **Project supervisor allotment**: The convener DPEC shall allot, during the last week of 6th semester, the faculty supervisors to all project teams

(a) <u>The project supervisors shall</u>

i. **define project objectives and expected deliverables**
ii. **help the students plan their project work and timeline**
iii. **provide enough resources for successful project completion**

(vi) <u>The faculty supervisors are expected to provide guidance to project teams on</u>

(a) *Knowledge, skills and qualities (KSQ) to be acquired* to propose solutions to the identified real-world problems

(b) *Problem analysis* - to identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

(c) *Applying engineering knowledge* - to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

(d) *Design/development of solutions* - to design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental Considerations

(e) *Conduct investigations of complex problems* - to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

(f) *Modern tool usage* – to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

(g) *Engineering and society* – to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

(h) *Environment and sustainability* – to understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development

(i) *Ethics* – to apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice

(j) *Individual and team work* – to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

(k) *Communication* – to communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

(l) *Project management and finance* – to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

(m) *Life-long learning* – to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

(vii) <u>The project supervisors are also expected to continuously emphasize and guide students on</u>

(a) Meeting Cadence:

i. **Regular meetings with supervisor:** Short and frequent meetings increase a team's work momentum. Regular meetings with supervisor to review the status of project are very essential. All students of the team shall participate in discussions and take notes.

ii. **Meeting Frequency: Semi-weekly cadence,** i.e., the meeting frequency shall be **twice a week.** Due weightage will be given to meeting cadence and considered for evaluation during presentations, i.e., number of planned meetings and number attended by students

(b) **Project Log Book:** The activity journaling in project log book is very important for a successful project.

i. Project log book is a written record showing the daily project activity on project goals from the very first thing like starting the project (an introduction statement what the project is all about), to the completion of the work (including the final results, and

whether project met the core objectives / outcomes, etc.).

ii. In project log book, the activities like regular meetings with project supervisor, and work carried out on daily/weekly basis are to be recorded. This ensures that the student progress is being monitored well.

iii. The project supervisor shall regularly check the log book of every student of project team and endorse each and every activity by affixing his signature with date. With this, the number of planned meetings and number attended by the students will be also monitored.

iv. Log books are to be shown during all presentations and will be graded along with the project.

v. At the conclusion of the project work *phase-I*, the supervisor shall specifically comment, in the project log book, on whether the project team met each of the project work *phase-I* goals and to give evidence which describes the quality of work. For project teams, this also serves as self-assessment.

(c) **Following project timeline**: completing the tasks as planned in project timeline

(d) The relevant knowledge, skills and qualities (**KSQ**) an engineering graduate should possess, which can be specially acquired by participating in major project work

(e) **Writing down whatever is done and making notes of whatever is read.** Writing down the procedures/models followed, designs made, experiments conducted, simulations carried out, intermediate results obtained, ***difficulties faced and how they were fixed*** are very important. This kind of documenting the whole process as we go with project implementation is a very effective way and will help preparing a well- documented report having original content. Note down and include information about all the resources that you used, magazines, Journals, patents, books, and so on.

This information will be needed for the bibliography in your project report. On the other hand, documenting a report ***on the spur of the moment*** would end up copying things from other sources resulting in a plagiarized document.

(f) **Good and sufficient literature review**: Literature review is a description and analysis of information related to the topic of project work. Reading good number of review articles, research articles published in recent issues of peer reviewed journals, technical magazines, patents, reference books on the topics of potential interest, will help one understand what has already been discovered and what questions remain to identify gaps in the literature.

(g) Completing nearly 50 - 75% of the proposed work during phase-I

(h) Right conduct of research to promote academic integrity, honesty and time management

(i) Preparing a well-documented report in proper format, covering the progress made during Phase-I

(j) Consequences of plagiarism and use of anti-plagiarism software to detect plagiarism in documents

(k) Submission of major project phase-I report within acceptable plagiarism levels, as per the ***Anti-plagiarism policy-2020 of our institute***.

(l) **Video pitch:** Capturing short videos, photos, screenshots on experiments conducted, simulations carried out, prototype / working model / process / software package / system developed during course of project execution, photos showing interaction with supervisor for creating a short video pitch on the work done during *phase-I*.

(m) **Project Paper**: Writing a technical paper at the end of *phase-II* based on the solution(s) proposed, results obtained, and prototype / working model / process / software package / system developed, for submission to a reputed non-predatory conference/non-paid peer reviewed journal.

(n) **Project poster**: At the end of phase-II, the project teams shall have to present their project in the form of posters, at the time of demonstration of complete porotype / working model / software package / system developed.

(viii) Phase – I evaluation: There shall be only Continuous Internal Evaluation (CIE) for major project work *phase-I* with following components

(a) **Registration Presentation** *(during second / third week of 7th semester):* The Registration Presentation shall include a brief report and presentation focusing the identified problem, objective(s), literature review, identifying research gap in the literature, implementation of existing methods, proposed solution, and expected outcome(s).

i. The registration presentation shall invariably include the **project plan timeline** with actual start and finish dates– monthly/weekly project milestones/ timeline prepared in MS Excel or any other project management tool.

ii. **Project timeline –** *Weekly project milestones*: It's a compact and creative way to present a project plan. Identify the project intermediate goals and related tasks for completing each of those goals. Categorize tasks for each week. In the project timeline use different colors to the tasks for each week. Horizontal timeline layouts shall be preferred or any other layout of team's choice.

iii. Project teams shall create and present the following during registration presentation
   1. *Complete project timeline*
   2. *Phase-I project timeline*
   3. *Phase-II project timeline*

iv. During every presentation, project teams shall compulsorily show the following as part of their presentation
   1. *The slides on project timeline and*
   2. *A table showing targeted tasks as per timeline and status – whether tasks accomplished?*

v. **Project log book**: Every student of the Project team shall compulsorily show the activity journaling in the log book (*with due signatures of project supervisor*) during presentations

(b) **Progress Presentation-I** *(during penultimate week of 7th semester):* At the end of first stage (7th semester), student teams shall be required present, before the DPEC, the progress made during phase-I and submit a well-documented report of work done for evaluation to the project coordinator

i. **Following project timeline**: The project timeline shall be meticulously followed and the tasks shall be completed as planned in project timeline.

ii. Project teams shall compulsorily show the following as part of their progress presentation-I
   1. *The slides on project timeline and*
   2. *A table showing targeted tasks as per timeline and whether tasks accomplished?*

iii. **Project log book**: Every student of the Project team shall compulsorily show the activity journaling in the log book (*with due signatures of project supervisor*)

(c) **CIE schedule**: The convener DPEC shall release complete schedule of CIE before start of 7th semester well in advance, so that student teams will complete the scheduled works and get ready with informative, confident and comfortable presentation for registration and progress presentations.

(ix) CIE for the Major project work phase-I shall be as given below:

Major project work Phase-I Assessment *(7th semester)*	**Weightage**
A. Supervisor Assessment	**20%**
B. DPEC Assessment *(i) Registration Presentation (10%)* *(ii) Progress Presentation-I (20%)* *(iii) Project progress*: Part of working model/ process/software package/system developed (30%)* *(iii) Well-documented Progress Report on Phase-I work (10%)* *(iv) Video pitch on Phase-I (10%)*	**80%**
Total Weightage	**100 %**

** Students are advised to complete major part of the project in phase-I only*

(a) **Working Model:** Every project team shall be required to develop a working model/ process/software package/system, on the chosen work. The progress made in this shall be demonstrated during progress presentation-I at the end of *phase-I* and the completed working model/ process/software package/system before the DPEC as per the dates specified by DPEC at the end of *phase-II*.

(b) **Progress Report on *phase-I*:** Every project team shall be required to submit a well-documented progress report on dissertation phase-I as per format specified by DPEC.

a. **Tangible outcomes of *phase-I* in Conclusions - Chapter:** These are the lessons learnt from doing a project work. The students have to describe in their own words what they learnt from the *phase-I* project work experience. They have to describe what specific KSQs are acquired by them, with reference to the expected COs, after successful completion of *phase-I* work. Finally, a table depicting systematic mapping of what they have learnt and the expected major project work COs, is to be presented in the conclusions chapter of *phase-I* report

(c) **Video pitch on *phase-I*:** Every project team shall be required to create a pitch video, which is a video presentation on their major project work *phase-I*. The project team shall present the produced video pitch during progress presentation-I. The produced video pitch should

a. be 3 to 5-minute-long video (no longer than 5 minutes)
b. be concise and to the point, on the problem and proposed solution
c. show project timeline and sample page of log book
d. highlight the progress made at various stages during *phase-I* project implementation with the help of short videos / photos / screenshots on experiments conducted, simulations carried out, part of prototype / working model / process / software package / system being under development as part of proposed solution and also photos showing team interactions with supervisor and the team working in the lab on project
e. discuss the impact of proposed solution in *ethical, environmental, societal and sustainable development contexts.*
f. emphasize key points about *business idea, potential market for the proposed solution*

(x) It is mandatory for

(a) every student of the team to *appear for oral presentation and viva-voce*, as part of progress presentation -I to qualify for course evaluation
(b) every project team *to submit a well-documented progress report on major project work phase-I*, as part of progress presentation -I to qualify for course evaluation
(c) every project team to create and present a good video pitch on major project work *phase-I*, as part of progress presentation -I to qualify for course evaluation

(xi) A student shall register for supplementary examination for the Major project work *phase-I* in the following cases:

(a) He/she is absent for oral presentation and viva-voce as part of progress presentation-I
(b) The project team fails to submit the progress report on *phase-I* in prescribed format
(c) The project team fails to submit the video pitch on the progress made during the *phase-I* period.
(d) he/she fails to fulfill the requirements of Major project work *phase-I* evaluation as per specified guidelines

(xii) Supplementary examination for Major project work *phase-I*

(a) The CoE shall send the list of students, registered for supplementary examination, to the HoDs concerned
(b) The DPEC, duly constituted by the HoD, shall conduct Major project phase-I supplementary exam and send the award list to the CoE within the stipulated time

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Course Learning Outcomes (COs):

Upon completion of major project work, students will be able to…

CO1: *review research literature, identify gaps in the literature, formulate problem, apply knowledge of mathematics, sciences, engineering fundamentals, experimental and data analysis techniques; synthesize technical knowledge and innovative approaches to generate suitable solutions for real- world complex engineering problems* (**Technical skills**)

CO2: *design a system or product based on product/customer specifications; develop, analyze, and critically evaluate the design alternatives in order to justify the solutions to a real-world problem guided by ethical, environmental, societal and sustainable development considerations; use modern engineering and IT tools to design, build and test a prototype within specified project timeline and budget* (**Problem solving and critical thinking skills**)

CO3: *apply project management and organizational skills; demonstrate integrity, leadership, creativity, professional and ethical responsibilities as an individual and as a member or leader to produce time-sensitive deliverables in a multi-disciplinary team* (**Ethics and teamwork**)

CO4: *collate the results, compare performance of prototype to design specifications and present clearly and effectively the proposed solution, conclusions and/or recommendations in written (report, poster, technical paper), oral (presentations) and multimedia formats (video pitch) and engage in self-directed independent learning and life-long learning demonstrating the KSQ of a professional engineer* (**Communication skills and life-long learning**)

Course Articulation Matrix (CAM) : U18EE707 MAJOR PROJECT WORK PHASE-I

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**U18EE707.1**	2	2	2	2	-	-	-	3	-	2	-	3	2	2
CO2	**U18EE707.2**	2	2	2	-	2	2	2	3	-	-	-	3	2	2
CO3	**U18EE707.3**	-	-	-	-	-	-	-	3	2	-	2	3	2	2
CO4	**U18EE707.4**	-	-	2	2	-	-	-	3	-	2	-	3	2	2
U18EE707		**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**2**

U18EE708 INTERNSHIP EVALUATION

Class: B.Tech., VII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
6 - 8 weeks internship			

Examination Scheme:

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives (LOs):

The internships will develop student interns' knowledge in real-world or industry environment in/on

LO1: pre-employment training opportunities, career information and employability-enhancement skills
LO2: communication and personal development skills
LO3: critical thinking and problem-solving skills
LO4: professionalism / work ethics and teamwork / collaboration in real organizational setting

Mandatory Internships:

1. The internships provide exposure to the real-world, get a feel for the work environment and how a professional workplace operates.
2. During the internship, students will experience a real-life engineering workplace and understand how their engineering and professional knowledge, skills and qualities (KSQs) can be utilized in industry.
3. Students can learn, more importantly, how to apply the KSQs they have acquired during an internship to their future workplaces.
4. Students will also be able to demonstrate functioning engineering knowledge, both new & existing, and identify areas of further development for their future careers.
5. Internships give the student an opportunity to bridge theory and practice
6. Internships also provide students with the soft skills needed at workplace and leadership positions.
7. The internship guidelines are governed by the rules stipulated in the Institute's Internship policy-2020 document.
8. The students shall have to undergo 6-8 weeks of mandatory internship during summer/winter vacation at industry/R&D organization / Academic Institutes like IITs, IIITs& NITs.
9. HoD, along with Prof i/c internships, shall address students (*of 2nd, 4th and 6th semesters*) during last week of even semester of every academic year on the following
    a. creating awareness on mandatory 6-8 weeks internship by every student
    b. creating awareness on COs of internships
    c. KSQs the students would acquire doing internships
    d. expected internship outcomes
    e. available internship options, and organizations offering internships
    f. progressively completing 6-8 weeks internship by the end of 6th semester summer, starting from 2nd semester summer break.
    g. internship evaluation in 7th semester
    h. internship report submission and oral presentation (through PPT) by student
10. Students undergoing the internship shall be required to submit their details to the department

internship coordinators of the respective branches. He will coordinate all the internship activities of the students of that department.

11. Students have to submit a signed undertaking to the department internship coordinator for demonstrating honesty, integrity, professionalism and regular attendance at work place to add value to the organization where the internship is allotted. Students also have to uphold the professional image of our institute.
12. In case, a student is found to violate the internship rules and regulations, the student will have to produce a valid reason for the violation of internship rules. Without a valid reason, the student will be debarred from taking part in subsequent placement activities of the institute.
13. The students preferably shall undergo internship at one organization only. In case of any difficulty, the stipulated period of internship shall be completed at different organizations with minimum of one week internship at every stage.
14. The internship evaluation shall be done in the VII semester of study and hence the students shall complete the prescribed period of internship before start of VII semester (from end of II semester to commencement of VII semester).
15. The student learning assessment process (SLAP): The SLAP in internships shall include feedback from internship supervisor, submission of internship report on the complete internship and PPT presentation.
16. Internship Log Book: The activity journaling in a log book is very important for a successful internship.
    a. The internship supervisor identifies the work goals at the beginning of the internship
    b. Student has to maintain internship log book, where in the activities undertaken during internship and timely submission at periodic intervals are to be documented.
    c. At the conclusion of the internship, the supervisor shall specifically comment, in the internship log book, on whether the student met each of the work goals and to give evidence which describes the quality of work. For student, this also serves as a self- assessment.
    d. Internship log book *(with due signatures of the internship supervisor)* shall be considered for evaluation during presentation, i.e., number of planned meetings with internship supervisor and number attended by student

17. **Meeting Cadence:**
    i. **Regular meetings with internship supervisor:** Regular meetings with the internship supervisor to discuss work goals and review the status of activities undertaken are very essential. Student shall participate in discussions and take notes.
    ii. **Meeting Frequency:** The meeting cadence, *i.e., meeting frequency* shall be fixed in consultation with the internship supervisor and accordingly student has to participate in discussions and take notes. Take signatures of internship supervisor as per the planned cadence in the internship log book.
18. The internship evaluation shall be done by ***department internship evaluation committee*** **(DIEC)** based on the submitted report by student and oral presentation.
19. There shall be only Continuous Internal Evaluation (CIE) for internship evaluation.
20. CIE for the Internship evaluation in VII semester shall be as below:

Internship evaluation	**Weightage**
A. **Internship Supervisor's Assessment**	

(i) Feedback from the internship supervisor *- on completion of internship assignment / work (20%)* *(ii) Feedback from the internship supervisor* *- on quality of work in internship assignment / work (10%)* *(iii) Feedback from the internship supervisor* *- internship log book (10%)* *(iv) Feedback from the internship supervisor* *- on attendance, punctuality and work hours (10%)* (For the case of 6-8 weeks internship done in more than one spell, it will be average of all the internship supervisors' assessment)	**50%**
B. DIEC Assessment *(i) Internship duration (8 /6 weeks) (15% / 10%)* *(ii) Internship Report (20%)* *(iii) Oral Presentation (with PPT) and viva voce (15%)*	**50%**
Total Weightage:	**100%**

Note: *It is mandatory for the student to appear for oral presentation (with PPT) and viva voce to qualify for course evaluation*

(a) Internship Report: Each student is required to submit a well-documented internship report (both *soft copy and softbound hard copy*) as per format specified by DIEC. In case of completing the 6-8 weeks internship in more than one organization, the student shall be required to prepare separate softbound internship reports signed by the internship supervisor(s)along with the seal(s) of the organization(s). The student shall submit two final softbound internship reports along with a soft copy, keeping all the certificate(s) issued by the internship supervisor(s) and all the individual internship reports cleared by respective internship supervisor. The Chapter-1 of the final internship report shall clearly describe the following indicating overall summary.

(i) **Internship(s) attended**: A table with name & address of organization, organization's vision and mission, internship weeks attended, internship period (exact dates attended), internship supervisor, head of the section and head of the organization

(ii) **Duties/tasks during internship(s)**: Table describing name & address of organization, and the duties / tasks undertaken during internships. This indicates what opportunities and learning experiences the interns got to get hands-on experience on a wide range of KSQs of a professional engineer.

(iii) **Tangible outcomes of internship:** These are the lessons learnt from internship experience. The students have to describe in their own words what they learnt from the internship experience. The student has to describe what specific KSQs are acquired by him, with reference to the expected internship COs, after successful completion of internship(s). Finally, a table depicting systematic mapping of what they have learnt and the expected internship COs, is to be shown.

(iv) **Student feedback on internship:** To gather information on whether internship was useful and gave practical experience on chosen field of interest, and other learning, a well-defined feedback questionnaire (*made available by the dept*)with closed and open questions shall be kept in the report.

(v) **Pictures at the worksite**: Student has to keep, in the report, his working pictures at the worksite, discussing with the internship supervisor, the creative project he is working on, or an event he is attending for work, group photo of the team/section/department he worked with.

(b) Anti-Plagiarism Check: The internship report should clear plagiarism check as per the Anti-Plagiarism policy-2020 of the institute.

(c) Presentation: Each student should prepare PPT with informative slides and make an effective oral presentation before the DIEC as per the schedule notified by the department. The presentation shall compulsorily have slides on the points mentioned in (a)(i)-(v)

(d) It is mandatory for every student to *appear for oral presentation(with PPT) and viva-voce*, to qualify for internship evaluation

(e) A student shall register for supplementary examination for the internship evaluation in the following cases:

(i) absent for oral presentation and viva-voce
(ii) fails to submit the internship report in prescribed format
(iii) fails to fulfill the requirements of internship evaluation as per specified guidelines

(f) Supplementary examination for internship evaluation

(i) The CoE shall send the list of students, registered for supplementary examination, to the HoD concerned
(ii) The DIEC, duly constituted by the HoD, shall conduct internship evaluation supplementary exam and send the award list to the CoE within the stipulated time

Course Learning Outcomes (COs):

Upon completion of the internship, student interns will be able to…

CO1: *gain career awareness, company/industry/workspace related knowledge, skills and work experience to add to resume, employer expectations for workplace behaviours; explore career alternatives prior to graduation; initiate and build a professional network and acquire employment contacts leading directly to a full-time job following graduation from institute; apply practice-oriented 'hands-on' interdisciplinary working experience in the real world orindustry to solve real life challenges in the workplace by integrating academic theory and practice and analysing work environment and conditions; commitment to quality and continuous improvement; integrate internship experience with academic plan and articulate career options* ***(Career information and employability-enhancement skills)***

CO2: *receive and interpret messages in the communication; present thoughts and ideas clearly and effectively in oral, written, computer-based, graphical forms as required for particular workplace settings; collaborate effectively and appropriately with different professionals in the work environment; demonstrate time management, planning, independence, professional judgement and positive attitudes (self-reliance & self-confidence, openness, respect, proactive attitude, conscientiousness)****(Communication and personal development skills)***

CO3: *review research literature, apply the knowledge of science, mathematics, and engineering with higher order cognitive skills to solve real-world problems and impact of solutions in society, environment and sustainability contexts; integrate existing and new technologies for industrial application; conduct investigations of problems; demonstrate analytical skills, including the ability to understand information and interpret data; exhibit foresight, independent thinking, resourcefulness, and the ability to make decisions; design systems, devices and components as needed and use the right tool (e.g., strategy, system, technology, etc.) for the right task* ***(Critical thinking and problem solving skills)***

CO4: *demonstrate effective leadership with work ethics including time management, punctuality, honesty, integrity, personal accountability, adaptability; work effectively in teams and real multidisciplinary organizational settings; interact respectfully with all people and understand individuals' differences; build professional relationships with interpersonal skills; maintain a sense of commitment to professional, ethical and social responsibilities; engage on life-long learning of technologies through critical reflection of internship experiences and the KSQ of a professional engineer* ***(Professionalism / Work ethic and Teamwork / Collaboration)***

Course Articulation Matrix (CAM) : U18EE708 INTERNSHIP															
CO	**CO code**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PSO**	**PSO**

		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	U18EE708.1	3	-	-	-	-	3	-	3	-	-	3	3	3	3
CO2	U18EE708.2	-	-	-	-	-	-	-	3	-	3	3	3	3	3
CO3	U18EE708.3	3	3	3	3	3	3	3	3	-	-	3	3	3	3
CO4	U18EE708.4	-	-	-	-	-	-	-	3	3	-	3	3	3	3
U18EE708		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15

(An Autonomous Institute under Kakatiya University, Warangal)

SCHEME OF INSTRUCTIONS & EVALUATION

VIII-SEMESTER OF 4-YEAR B.TECH. DEGREE PROGRAMME

(3Th+1Major Project)

Sl.No	Course Category	Course Code	Course Name	Periods/week			Credits	Evaluation Scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	PE	U18EE801	Professional Elective -V / MOOC -V	3	-	-	3	10	30	40	60	100
2	PE	U18EE802	Professional Elective -VI/MOOC -VI	3	-	-	3	10	30	40	60	100
3	OE	U18OE803	Open Elective -IV / MOOC -VII	3	-	-	3	10	30	40	60	100
4	PROJ	U18EE804	Major Project - Phase - II	-	-	14	7	40	-	40	60	100
Total				**9**	**-**	**14**	**16**	**70**	**90**	**160**	**240**	**400**
Additional Learning*: *Maximum credits allowed for Honours/Minor*				-	-	-	*7*	-	-	-	-	-
Total credits for Honours/Minor students:				**-**	**-**	**-**	***16+7***	**-**	**-**	**-**	**-**	**-**

** List of courses for additional learning through **MOOCs** towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

Note: L - Lectures; T – Tutorials; P – Practicals; CIE – Continuous Internal Evaluation; TA – Teachers Assessment; MSE – Mid Semester Examination; ESE – End Semester Examination;

Student Contact Hours/Week : 23

Total Credits(C) : 16

Professional Elective-V / MOOC-V

U18EE801A: AI Techniques in Electrical Engineering
U18EE801B: Electrical Power Distribution Systems
U18EE801C: Power System Automation using SCADA
U18EE801M: MOOCs Course

Professional Elective-VI /MOOC-VI

U18EE802A: Digital Control Systems
U18EE802B: Advance Power System Protection
U18EE802C: Digital Signal Processing
U18EE802M: MOOCs Course

Open Elective-IV / MOOC-VII

U18OE803A: Operations Research
U18OE803B: Management Information Systems
U18OE803C: Entrepreneurship Development
U18OE803D: Forex and Foreign Trade
U18OE803M: MOOCs Course

U18EE801A AI TECHNIQUES IN ELECTRICAL ENGINEERING

Class: B.Tech., VIII-Semester
Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: architectures and learning strategies of artificial neural networks
LO2: multilayer perceptrons, backpropagation algorithm
LO3: properties and operations of fuzzy relations, defuzzification methods and applications of fuzzy in electrical engineering
LO4: genetic modeling, crossover, mutation operator and applications in electrical engineering

UNIT – I (9)

Introduction: Humans and Computers, organization of the brain, biological neuron

Artificial Neural Networks (ANNs): Biological and artificial neuron models, types of neuron activation function, ANN architectures, learning strategy, supervised, and unsupervised learning, reinforcement learning rules, perceptron models, training algorithms, limitations of the perceptron model

UNIT – II (9)

Multilayer Feed forward Neural Networks: Introduction to single layer and multilayer neural networks, Back propagation Algorithm (BPA), limitations of BPA, Self – Organizing Map (SOM), Radial Basis Function Network-Functional Link Network (FLN), Hopfield Network

ANN Applications: Economic load dispatch, load forecasting, fault diagnosis

UNIT – III (9)

Introduction to Fuzzy Logic (FLC): Introduction, fuzzy versus crisp, fuzzy sets, membership function, basic fuzzy set operations, properties of fuzzy sets, fuzzy cartesian product, operations on fuzzy relations, fuzzy quantifiers, fuzzy inference, fuzzy rule-based system, defuzzification methods

Fuzzy Logic Applications: Load frequency control, power electronic converters for smart power systems

UNIT – IV (9)

Genetic Algorithm: Introduction, encoding, fitness function, reproduction operators, genetic modeling

Genetic operators: crossover, single–site crossover, two-point crossover, multi point crossover, uniform crossover, matrix crossover, crossover rate, inversion & deletion, mutation operator, mutation, mutation rate-bit-wise operators, applications in electrical engineering

GA Applications: Improved performance of boost converters, Power system optimization with FACTS devices

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Textbooks:

[1]. S. Rajasekaran and G.A.V. Pai, *Neural Networks, Fuzzy Logic & Genetic Algorithms: Synthesis and Applications*, 2nd ed., New Delhi:PHI Learning Pvt. Ltd., 2006. (Units 2,3,4)

[2]. S. N. Sivanandam and S. N. Deepa, *Principles of Soft Computing*, New Jersey: John Wiley & Sons, 2007. (Unit-1)

Reference Books:

[5]. Simon Haykin, *Neural Networks Comprehensive Foundation*, 2nd ed.,New Delhi: Pearson Education, 2005.
[6]. Timothy J. Ross, *Fuzzy logic with engineering applications*, New Delhi: McGraw Hill (India) Private Limited,2010.
[7]. Huaguang Zhang, Derong Liu, *Fuzzy Modeling and Fuzzy Control*, Germany: Springer Birkhauser Publishers, 2006.
[8]. R. Beale, T. Jackson, *Neural Computing: An Introduction*, UK: CRC Press, Taylor and Francis group, 1990.

Research Articles:

[1]. Abdussalam Ali Ahmed, et al., "*Using Of Neural Network Controller And Fuzzy PID Control To Improve Electric Vehicle Stability Based On A14-DOF Model*", 2020 International Conference on Electrical Engineering (ICEE), **DOI:** 10.1109/ICEE49691.2020.9249784.

[2]. Renny Rakhmawati, et al., "Performance *Evaluation of Speed Controller Permanent DC Motor in Electric Bike Using Fuzzy Logic Control System*", 2018 International Seminar on Application for Technology of Information and Communication, **DOI:** 10.1109/ISEMANTIC.2018.8549813.

[3]. Omar Oubrahim, et al., "*Performance Improvement of Grid connected PV System Using Neuro-Fuzzy Controller*", 2020 International Conference on Sustainable Energy Engineering and Application (ICSEEA), **DOI:** 10.1109/ICSEEA50711.2020.9306130.

[4]. Era Purwanto, et al., "*Implementation of Genetic Algorithm for Induction Motor Speed Control Based on Vector Control Method*", 2019 International Seminar on Research of Information Technology and Intelligent Systems (ISRITI), **DOI:** 10.1109/ISRITI48646.2019.9034674.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: describe the architectures and compare the learning strategies of artificial neural networks
CO2: compare different algorithms of ANN and apply them for a given application
CO3: apply fuzzy relations, defuzzification methods to develop fuzzy model of a given application
CO4: describe the concept of genetic algorithm and apply them for electrical engineering applications

Course Articulation Matrix: U18EE801A AI TECHNIQUES IN ELECTRICAL ENGINEERING

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**U18EE801A.1**	2	1	-	-	-	-	-	-	1	1	-	1	1	1
CO2	**U18EE801A.2**	2	1	1	1	1	-	-	-	1	1	1	1	2	1
CO3	**U18EE801A.3**	2	2	1	1	1	-	-	-	1	1	1	1	2	1
CO4	**U18EE801A.4**	2	2	1	1	1	-	-	-	1	1	1	1	2	1
U18EE801A		**2**	**1.5**	**1**	**1**	**1**	**-**	**-**	**-**	**1**	**1**	**1**	**1**	**1**	**1**

U18EE801B ELECTRICAL POWER DISTRIBUTION SYSTEMS

Class: B.Tech., VIII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on

LO5: distribution system planning and load management
LO6: design considerations of a substation
LO7: distribution system reliability indices
LO8: smart grids in distribution system

UNIT-I (9)

Introduction to distribution system planning: Distribution system planning, factors affecting system planning, present distribution system planning techniques, distribution system planning models, future nature of distribution planning, central role of the computer in distribution planning

Load characteristics: Basic definitions, maximum diversified demand, relationship between the load and loss factors, load management, rate structure

UNIT-II (9)

Subtransmission lines and distribution Substations: Introduction, sub-transmission line costs, substation costs, substation bus schemes, comparison of the switching schemes, substation location, rating of a distribution substation, voltage drop and power loss calculations for a service area with four and six feeders and calculations for a service area with n-feeders, comparison of the four and six feeder patterns, compute the K-constant and substation application curves

UNIT-III (9)

Distribution system Reliability: Basic definitions, appropriate levels of distribution reliability, basic reliability concepts and mathematics, series systems, parallel systems, series and parallel combinations, Markov processes, distribution reliability indices, sustained interruption indices, load and energy-based indices, benefits of reliability modelling in system performance

UNIT-IV (9)

Smart Grids: Basic definitions, need for establishment of smart grid, smart grid applications versus business objectives, roots of the motivation for the smart grid, integration of smart grid with the distribution management system, future of a smart grid, evolution of smart grid, standards of smart grids, existing challenges to the application of the concept of smart grids, block chain technology, Internet of Things (IoT) applications in distribution system

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Textbooks:

[1] Turan Gonen, *Electric power Distribution System Engineering*, 2nd ed., UK: CRC Press, 2007.
[2] Jame. A. Momoh, *Electric Power Distribution, Automation, Protection, And Control*, UK: CRC Press, 2007.

Reference Books:

[1] A. S. Pabla, *Electric Power Distribution*, 5th ed., New Delhi: McGraw Hill (India) Private Limited, 2004.
[2] V. Kamaraju, *Electrical Power Distribution Systems*, 2nd ed., New Delhi: McGraw Hill (India) Private Limited, 2010.

[3] Stuart Borlase, *Smart Grids, Infrastructure, Technology and Solutions*, UK: CRC Press, 2013.

Research Articles:

[1] H. Farzin, M. Fotuhi-Firuzabad and M. Moeini-Aghtaie, *Role of Outage Management Strategy in Reliability Performance of Multi-Microgrid Distribution Systems*, IEEE Transactions on Power Systems, vol. 33, no. 3, pp. 2359-2369, May 2018.

[2] Z. Li, W. Wu, X. Tai and B. Zhang, *A Reliability-Constrained Expansion Planning Model for Mesh Distribution Networks, IEEE Transactions on Power Systems*, vol. 36, no. 2, pp. 948-960, March 2021.

[3] R. Morello, C. De Capua, G. Fulco and S. C. Mukhopadhyay, *A Smart Power Meter to Monitor Energy Flow in Smart Grids: The Role of Advanced Sensing and IoT in the Electric Grid of the Future*, IEEE Sensors Journal, vol. 17, no. 23, pp. 7828-7837, 1 Dec.1, 2017.

[4] V. Dehalwar, M. L. Kolhe, S. Solanki, M. K. Jhariya and K. Ogura, *Blockchain based Device identification and authentication in a Smart Grid*, 2020 5th International Conference on Smart and Sustainable Technologies (SpliTech), pp. 1-5, 2020.

[5] X. Fu, H. Wang and Z. Wang, *Research on Block-Chain-Based Intelligent Transaction and Collaborative Scheduling Strategies for Large Grid*, IEEE Access, vol. 8, pp. 151866-151877, 2020.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: describe the various aspects to be considered in planning the distribution system & load management

CO2: compare switching schemes and compute voltage drop & power loss calculations for a service area with n-feeders

CO3: compare series & parallel distribution systems and list the indices that are employed in distribution system

CO4: describe the importance of smart grid, block chain technology & IOT in power distribution system

Course Articulation Matrix: U18EE801B ELECTRICAL POWER DISTRIBUTION SYSTEMS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE801B.1	2	1	-	-	1	1	-	1	1	1	1	1	2	1
CO2	U18EE801B.2	2	2	1	-	-	2	-	1	1	1	-	1	2	1
CO3	U18EE801B.3	2	1	-	1	2	-	1	1	1	1	1	1	2	1
CO4	U18EE801B.4	2	-	-	-	2	-	1	1	1	1	-	1	2	1
U18EE801B		**2**	**1.33**	**1**	**1**	**1.66**	**1.5**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**

U18EE801C POWER SYSTEM AUTOMATION USING SCADA

Class: B.Tech., VIII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: the role of central control room management and operations in the distribution automation environment

LO2: supervisory control and data acquisition (SCADA)

LO3: technical benefits of SCADA software

LO4: techniques employed for the improvement in voltage profile of distribution systems with substation automation, and feeder automation

UNIT – I(9)

Introduction: Purpose of automatic power control systems, elements of automatic power control systems, automatic power control and controllers, relays, and relaying devices

Distribution management system: short-term load forecasting, long-term energy forecasting, distributed energy supply system

Distribution Automation: problems with existing distribution system, need for distribution automation, characteristics of distribution system

UNIT – II (9)

SCADA system: Introduction, block diagram, components of SCADA, functions of SCADA, SCADA applied to distribution automation, advantages of DA through SCADA, requirements and feasibility, communication protocols in SCADA, high level data link control (HDLC) protocol

UNIT – III (9)

SCADA software and new technologies in SCADA systems: Comparison of SCADA with Distributed Control System (DCS), Programmable Logic Controller (PLC), smart instrument, Introduction of Phasor Measurement Units (PMUs) in Wide Area Measurement Systems (WAMS), comparison of SCADA with PMUs, new technologies in SCADA systems -Man machine interface

UNIT – IV (9)

Substation automation: Definition, functions of substation automation, state and trends of substation automation, Intelligent affordable substation monitoring and control

Feeder automation: Losses in distribution systems, system losses and loss reduction, network reconfiguration, improvement in voltage profile, capacitor placement for reactive power compensation, Algorithm for location of capacitor

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Textbooks:

[1]. Dr. M.K. Khedkar, Dr. G.M. Dhole, *A Textbook of Electric Power Distribution Automation,* New Delhi:University science press, 2010. (Chapter II, III, IV, V, and VI)

[2]. David Bailey, Edwin Wright, *Practical SCADA for Industry,* UK:Newnes, (an imprint of Elsevier), 2003. (Chapter I, II, and III)

Reference Books:

[1] A. B Barzam Translated from the Russian by P.I. Zabolotny, *Automation in electrical power systems*, Moscow:

MIR Publishers, 1977.
[2] Mini S. Thomas and John D. McDonald, Power System SCADA and Smart Grids, USA: CRC press, 2015.
[3] Stuart A Boyer, *SCADA: supervisory control and data acquisition*, 3rd ed.,USA: ISA- The Instrumentation, Systems, and Automation Society, 2004.
[4] KLS Sharma,*Overview of Industrial Process Automation*,2nd ed., UK: Elsevier Publication, 2017.
[5] Krishnakant,*Computer based Industrial Control*,5th ed., New Delhi:PHI Learning Pvt. Ltd.,2011.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: describe the role of central control room management & operations in distribution automation environment
CO2: describe the monitoring, event processing &control functions of SCADA
CO3: compare SCADA with distributed control system & PMU
CO4: apply the techniques employed for the improvement in voltage profile of distribution systems with substation automation and feeder automation

Course Articulation Matrix: U18EE801C POWER SYSTEM AUTOMATION USING SCADA

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE801C.1	2	2	-	-	1	1	1	-	1	1	-	1	2	1
CO2	U18EE801C.2	2	2	-	-	1	1	1	-	1	1	-	1	2	1
CO3	U18EE801C.3	2	1	-	-	1	1	1	-	1	1	-	1	2	1
CO4	U18EE801C.4	2	2	-	-	1	1	1	-	1	1	-	1	2	1
U18EE801C		**2**	**1.75**	**-**	**-**	**1**	**1**	**1**	**-**	**1**	**1**	**-**	**1**	**2**	**1**

U18EE802A DIGITAL CONTROL SYSTEMS

Class: B.Tech., VIII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO5: basic representation and applications of Digital Control Systems

LO6: reconstructing the original signal from sampled sequence and enhancing that signal using suitable filters

LO7: identifying state variables to describe a system by a set of first-order differential or difference equations for sampled systems

LO8: design concepts of digital control system using transient and frequency response methods

UNIT-I (9)

Introduction to Discrete Control Systems: Introduction, discrete time control, continuous timecontrol, comparison, block diagram of digital control

Z-Transforms: Z-Transforms of elementary functions, properties, inverse Z-transforms, Z- transform method for solving difference equations

UNIT-II (9)

Discrete type control system in Z-plane Analysis: Introduction, impulse sampling and data hold, Z-transform by convolution integral method, reconstruction of original signal from sampled signal pulse transfer function, realization of digital controllers and digital filters

UNIT-III (9)

State Variable Analysis of Digital Control Systems: Introduction, state description of digital processors, state description of sampled continuous time plants, solution of state difference equation

Controllability and observability: Controllability and observability, multi variable systems

UNIT-IV (9)

Design of Digital Control: Introduction, mapping between S-plane and Z-plane, stability analysis of closed loop system in Z-plane, transient and steady state response analysis, design based on root locus method and frequency response method

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Textbooks:

[1] K. Ogata, *Discrete-Time Control System*, 2nd ed., New Delhi: PHI Learning Pvt. Ltd., 1995 (Unit 1, 2 & 4).

[2] M. Gopal, *Digital Control and State Variable Methods*, 2nd ed., New Delhi: McGraw Hill (India) Private Limited, 2003. (Unit 3).

Reference Books:

[1] Benjamin C. Kuo, *Digital Control System*, 2nd ed., New Delhi: Oxford University Press, 2014.

[2] Charles L. Phillips, H. Troy Nagle, Aranya Chakrabortty, *Digital Control System Analysis & Design*, 4th ed., New Delhi: Pearson Education, 2015.

[3] M. Sami Fadalim, Antonio Visioli, *Digital control Engineering Analysis and Design*, 2nd ed., US: Academic Press,2013

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

After completion of this course, students will be able to…

CO1: differentiate between continuous-time & discrete-time control methods and solve any function using z-transforms & inverse z-transforms

CO2: reconstruct the original signal from any sampled sequence and reduce or enhance certain aspects of a signal using suitable filters

CO3: realize any given sampled system using state variable approach and apply the concepts of controllability & observability

CO4: design a system using root locus & bode plots

Course Articulation Matrix: U18EE802A DIGITAL CONTROL SYSTEMS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE802A.1	2	2	-	-	-	-	-	-	1	1	-	1	2	1
CO2	U18EE802A.2	2	2	1	-	-	-	-	-	1	1	-	1	2	1
CO3	U18EE802A.3	2	2	-	-	-	-	-	-	1	1	-	1	2	1
CO4	U18EE802A.4	2	2	1	-	-	-	-	-	1	1	-	1	2	1
U18EE802A		2	2	1	-	-	-	-	-	1	1	-	1	2	1

U18EE802B ADVANCE POWER SYSTEM PROTECTION

Class: B.Tech., VIII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: history of digital protection and components of the digital relays

LO2: sinusoidal-wave- based algorithms and Fourier transform & Walsh functions

LO3: differential protection of bus bars for internal and external faults and supervisory relays & protection of 3-phase busbars

LO4: numerical relays and numerical protection of transformer & transmission lines

UNIT – I (9)

Digital Protection: Historical background, performance and operational characteristics of digital protection, basic structure of digital relays, comparison of digital relays with electromagnetic and static relays.

Digital Relays: Basic components of digital relays with block diagram, signal conditioning subsystems, surge protection circuits, anti-aliasing filter, conversion subsystem, digital relay subsystem, the digital relay as a unit

UNIT – II (9)

Mathematical Background to protection algorithms:

Sinusoidal-Wave-Based Algorithms: Sample and first derivative method, first and second derivative method, two- sample technique, three sample technique

Fourier Transform and Walsh function analysis: The Fourier analysis-based algorithm: Full-cycle window algorithm, fractional cycle window algorithm, sub-cycle window algorithm, Fourier transform based algorithm; definition & properties of Walsh functions, discrete representation of Walsh functions, relationship between Fourier and Walsh coefficients, Walsh-function-based-algorithm: basic algorithm, algorithm for Walsh function determination, estimation of amplitude and phase angle of fundamental components

UNIT – III (9)

Busbar Protection: Introduction – differential protection of busbars, external and internal fault, actual behaviours of a protective CT, circuit model of a saturated CT, External fault with one CT saturation: need for high impedance bus bar protection, minimum internal fault that can be detected by the high impedance bus bar differential scheme, stability ratio of high impedance busbar differential scheme, supervisory relay, protection of three – phase busbars, numerical examples on design of high impedance busbar differential scheme

UNIT – IV (9)

Numerical Relays: Introduction, block diagram, sampling theorem correlation with a reference wave, Least Error Squared (LES) technique, digital filtering, numerical over-current protection

Numerical Protection of transformers and transmission lines: Numerical transformer differential protection, Numerical distance protection of transmission line, differential equation method and Mann & Morrison method

Wide area protection: Architecture of Wide area measurement systems (WAMS), WAMS based protection

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Textbooks:

[1] A.T. Johns and S. K. Salman, *Digital Protection for Power Systems*, Peter Peregrinus Ltd. on behalf of IEE Power Series 15, 1997. [Unit I & II]

[2] Y. G. Paithankar & S. R. Bhinde, *Fundamentals of Power System Protection*, 2nd ed., New Delhi: PHI Learning Pvt. Ltd., 2014. [Unit III & IV]

Reference Books / Articles:

[1] A. G. Phadke and James S. Thorp, *Computer Relaying for Power Systems*, 2nd ed., New Jersey: John-Wiley, 2009. [Wide Area Protection - Unit IV]

[2] J. Lewis Blackburn, Thomas J. Domin, *Protective Relaying Principles and Applications*, 4th ed., UK: CRC Press, 2014.

[3] ABB product data sheets, url: https://new.abb.com/medium-voltage/digital-substations/numerical-relays.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: describe the history of digital protection & components of digital relays

CO2: apply the concepts of sinusoidal-wave-based algorithms for predicting peak value from pre-fault signals, Fourier & Walsh transform for extracting fundamental component from fault signals

CO3: design a high impedance differential scheme for protection of busbars

CO4: apply suitable numerical relaying techniques for protection of transmission lines & transformers

Course Articulation Matrix: U18EE802B ADVANCE POWER SYSTEM PROTECTION

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE802B.1	1	-	-	-	-	-	-	-	1	1	-	1	1	-
CO2	U18EE802B.2	2	1	-	-	-	-	-	-	1	1	-	1	1	-
CO3	U18EE802B.3	1	1	1	-	-	-	-	-	1	1	-	1	2	1
CO4	U18EE802B.4	1	-	1	-	-	-	-	-	1	1	-	1	2	1
U18EE802B		**1.25**	**1**	**1**	**-**	-	-	**-**	**-**	**1**	**1**	-	**1**	**1.5**	**1**

U18EE802C DIGITAL SIGNAL PROCESSING

Class: B.Tech., VIII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: computation of discrete Fourier transform (DFT)

LO2: computational complexity of DFT & efficient implementation of DFT using fast Fourier transform (FFT)

LO3: design of analog Butterworth & Chebyshev filters, converting analog filter into equivalent digital filter using different mapping techniques

LO4: design of linear-phase FIR filters and Digital signal processors

UNIT–I (9)

Discrete Fourier Transform (DFT): Frequency domain sampling and reconstruction of discrete-time signals, DFT, properties of DFT, circular convolution, Inverse DFT (IDFT), frequency analysis of signals using DFT, relation between DFT, DTFT and Z-Transform, filtering long duration sequences, Discrete cosine transform (DCT).

UNIT–II (9)

Fast Fourier Transform (FFT): Computational complexity of DFT, introduction to FFT, Radix-2 FFT algorithms, Decimation-in-time FFT algorithm, Decimation-in-frequency FFT algorithm, Differences and similarities between DIT and DIF algorithms**,** Inverse DFT using FFT

System Realization: Realization of discrete-time systems, structures for realization of IIR systems-direct form-I, direct form-II, cascade form, parallel form, structures for realization of FIR systems-direct form, cascade form

UNIT–III (9)

Filter concepts: Causality and its implications, Paley-Wiener theorem, magnitude characteristics of physically realizable filters, phase delay, group delay, filter specifications

Infinite Impulse Response (IIR) Filters: Reliability of ideal filter, introduction to IIR filters, design of IIR digital filters from analog filter specifications, mapping techniques - impulse invariance and bilinear transformation IIR digital filter design using Butterworth and Chebyshev approximations, Frequency transformations, comparison of Butterworth and Chebyshev filters

UNIT – IV (9)

Finite Impulse Response (FIR) filters: Introduction to FIR filters, inherent stability, symmetric and anti-symmetric filters, design of linear phase FIR filters - Windowing method (rectangular window, triangular window, hamming window & Hanning window) and frequency sampling method; design of FIR differentiators, design of Hilbert transformers

DSP Processors: Introduction, Multiplier and Multiplier Accumulator (MAC), DSP Processor memory architecture, examples of DSP processors

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Textbooks:

[1] John G. Proakis and D.G. Manolakis, *Digital Signal Processing: Principles, Algorithms and Applications*, 4th ed., New Delhi: Pearson education, 2007. (Chapters 1,2, 7, 8, 10)

[2] S. Salivahanan, *Digital Signal Processing*, 3rd ed., New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2016(Chapters 16)

Reference Books:

[1] A. V. Oppenheim & R. W. Schafer, *Discrete-Time Signal Processing*, 2nd ed., New Delhi: PHI Learning Pvt. Ltd., 1999.

[2] Sanjit K. Mitra, *Digital Signal Processing – A Computer Based Approach*, 2nd ed., New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2002.

[3] Johnny R. Johnson, *Introduction to Digital Signal Processing*, New Delhi: PHI Learning Pvt. Ltd., 2001.

[4] Adreas Antanio, *Digital filter Analysis and Design*, 4th ed., New Delhi: McGraw Hill Education (India) Pvt Ltd., 1988.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: compute DFT of a given DT sequence and perform circular convolution using DFT & IDFT

CO2: determine 2, 4 & 8-point FFT of a sequence using radix-2 DIT & DIF algorithms and realize discrete time systems

CO3: design an IIR Butterworth & Chebyshev digital filter meeting the required specifications by performing impulse invariance/bilinear transformation

CO4: design a linear-phase FIR filter with a prescribed magnitude response using windowing & frequency sampling methods and understand the basics of DSP processors

Course Articulation Matrix (CAM): U18EE802C DIGITAL SIGNAL PROCESSING

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	U18EE802C.1	2	2	-	1	-	-	-	-	1	1	-	1	1	-
CO2	U18EE802C.2	2	2	-	1	-	-	-	-	1	1	-	1	1	-
CO3	U18EE802C.3	1	1	-	1	-	-	-	-	1	1	-	1	1	2
CO4	U18EE802C.4	1	1	-	1	-	-	-	-	1	1	-	1	1	2
U18EE802C		**1.5**	**1.5**	**-**	**1**	**-**	-	-	-	1	1	-	**1**	**1**	**2**

U18OE803A OPERATIONS RESEARCH

Class: B.Tech., VIII-Semester

Branch: ME, CSE, IT, CE, EEE, ECE, EIE

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: concepts to solve linear programming problems which arise in real life using various methods and their advantages

LO2: applications of linear programming namely transportation and assignment problems which arise in different engineering fields

LO3: non-linearity in optimization problems, direct search techniques and iterative methods

LO4: various queuing systems and their practical relevance

UNIT – I(9)

Linear Programming Problem (LPP): Mathematical models and basic concepts of linear programming problem; solution of linear programming problem - graphical method, simplex method, artificial variable techniques (Big-M and Two-phase method), duality in linear programming, dual simplex method

UNIT – II (9)

Special types of LPP: Mathematical model of transportation problem, methods of finding initial basic feasible solution, optimal solution of transportation problem, degeneracy in transportation problem; exceptional cases in transportation problem- unbalanced transportation problem, maximization transportation problem; assignment problem- mathematical formulation of the problem, hungarian method to solve an assignment problem, special cases in assignment problem- maximization assignment problem

UNIT – III (9)

Non-linear Programming Problem (NLPP): Classical method of optimization using Hessian matrix; iterative methods - random search methods-random jump method, random walk method, steepest decent method and conjugate gradient method; direct methods - Lagrange's method, Kuhn-Tucker conditions

UNIT – IV (9)

Queueing Theory: Queueing system- elements and operating characteristics of a queuing system; probability distributions in queueing systems- distribution of arrivals (pure birth process); classification of queueing models; Poisson queueing systems- Study of various characteristics of single server queuing model having infinite population $\{(M/M/1):(\infty/FIFO)\}$ and single server queuing model having finite population $\{(M/M/1):(N/FIFO)\}$, generalized model (Birth-Death process).

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Textbooks:

[1] Kanti swarup et.al, *Operations Research*, 16th ed., New Delhi: S. Chand & Sons, 2013. (Unit-I, Unit-II, Unit-IV)

[2] Singiresu S. Rao, *Engineering Optimization Theory and Practice*, 4th ed., Hoboken, New Jersey: John Wiley & Sons, Inc, 2009 (Unit-III)

Reference Books:

[1]. Hamdy. A. Taha, *Operations Research*, 7th ed., New Delhi: Prentice Hall of India Ltd, 2002.

[2]. J.C. Pant, *Introduction to Optimization*, 7th ed., New Delhi: Jain Brothers, 2012.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: model engineering real time problems and solve them using various LPP techniques
CO2: obtain the optimal solution of transportation, assignment problems and their real time applications
CO3: optimize the engineering problems using NLPP techniques
CO4: differentiate various queueing models and their practical relevance

Course Articulation Matrix: U18OE803A - OPEARTIONS RESEARCH

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE803A	2	2	-	-	-	-	-	-	-	1	-	1	-	-
CO2	U18OE803A	2	2	-	-	-	-	-	-	-	1	-	1	-	-
CO3	U18OE803A	2	2	-	-	-	-	-	-	-	1	-	1	-	-
CO4	U18OE803A	2	2	-	-	-	-	-	-	-	1	--	1	-	-
U18OE803A		**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**		**1**	**-**	**-**

U18OE803B MANAGEMENT INFORMATION SYSTEMS

Class: B.Tech., VIII-Semester

Branch: ME, CSE, IT, CE, EEE, ECE, EIE

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…

- *LO1: basic concepts and challenges of management information systems*
- *LO2: e-business and decision support systems techniques*
- *LO3: development process and design of management information systems*
- *LO4: different applications of management information systems*

UNIT – I (9)

Management Information Systems: Systems: An Overview : Introduction, need for management information systems, Management information systems: A concept, MIS: A definition, Management information system and information technology, nature and scope of MIS, MIS characteristics, Structure of MIS, types of MIS, role of MIS in global business, challenges of managing information systems, IT infrastructure and emerging technology

UNIT - II (9)

Business Applications of Information Systems:

E-Commerce, E-Business and E-Governance: Introduction, e-commerce, e-commerce sales life cycle, e-commerce infrastructure, e-commerce applications, e-commerce payment systems, management challenges and opportunities, e-business, e-governance

Decision Support Systems: Introduction, decision-making: a concept, Simon's model of decision-making, types of decisions, methods for decision-making, decision support techniques, decision-making and role of MIS, decision support systems, business intelligence, knowledge management systems

UNIT - III (9)

Development process of MIS : Development of long-range plans of the MIS, ascertaining the class of information, determining the information requirement, development and implementation of the MIS, management of information quality in the MIS, organisation for development of MIS, MIS: development process mode

Strategic Design of MIS : Strategic management of the business, why strategic design of MIS, balance score card, score card and dash board, strategic design of MIS, development process steps for strategic design (SD) of MIS, illustrating SD of MIS for big bazaar, strategic management of business and SD of MIS, business strategy determination, business strategy implementation

UNIT - IV (9)

Management of Global Enterprise : Enterprise management system, Enterprise Resource Planning (ERP) System, ERP model and modules, benefits of the ERP, ERP product evaluation, ERP implementation, Supply chain management (SCM), information management in SCM, Customer relationship management (CRM), management of global enterprise, EMS and MIS

Applications in Manufacturing Sector: Introduction, Personnel Management (PM), Financial Management (FM), Production Management (PM), Raw Materials Management (RMM), marketing management, corporate overview

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Textbooks:

[1] D.P.Goyal, Vikas, *Management Information Systems–Managerial Perspective*, 4th ed. Addison-Wesley, 2014. *(Unit 1)*

[2] Waman S. Jawadekar, *Management Information Systems Text and Cases: a Global Digital Enterprise Perspective,* 5th ed. McGraw Hill, 2014 *(Unit 2,3,4)*

Reference Books:

[1] Kenneth C. Laudon & Jane P. Laudon, *Management Information Systems,12th ed.* Prentice Hall, 2012.

[2] S. Sadagopan, *Management Information Systems,2nd ed.,* PHI Learning, 2014.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: explain the structure and importance of management information systems

CO2: analyze management information systems for decision making

CO3: explain the methodology to design and develop a management information system

CO4: *describe different applications of management information systems in various manufacturing sectors*

Course Articulation Matrix (CAM): U18OE803B MANAGEMENT INFORMATION SYSTEMS															
Course Outcomes		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18OE803B.1	2	2	1	1	1	-	-	-	-	1	-	1	-	-
CO2	U18OE803B.2	2	2	2	1	1	-	-	-	-	1	-	1	-	-
CO3	U18OE803B.3	2	2	2	3	1	-	-	-	-	1	-	2	-	-
CO4	U18OE803B.4	2	2	3	3	1	-	-	-	-	1	-	2	-	-
U18OE803B		2	2	2	2	1	-	-	-	-	1	-	1.5	-	-

U18OE803C ENTREPRENEURSHIP DEVELOPMENT

Class: B.Tech., VIII-Semester

Branch: ME, CSE, IT, CE, EEE, ECE, EIE

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LOs):

This course will develop students' knowledge in/on

LO1: various characteristics of entrepreneur and his role in development of the nation
LO2: creativity and business plan
LO3: functions of various managements/managers in industry
LO4: legal issues in entrepreneurship and intellectual property rights

UNIT –I (9)

Entrepreneurship: Definition, role of entrepreneurship in economic development, characteristics and types of an entrepreneur, forms of business organizations; agencies dealing with entrepreneurship and small scale industries; case studies of successful entrepreneurs- identification of business opportunities in various branches of engineering

UNIT-II (9)

Creativity and Business Idea: Sources of new ideas, methods of generating ideas and creative problem solving, concepts of innovation and incubation

Business Plan: definition, scope and value of business plan, market survey and demand survey

Feasibility studies: Technical feasibility, financial viability and social acceptability; Preparation of preliminary and bankable project reports

UNIT-III (9)

Project Planning: Product planning and development process, Sequentialsteps in executing the project.

Plant layout: Principles, types and factors influencing layouts

Material Management: Purchase procedures, Issues of Materials -LIFO,FIFO,HIFO and Base stock

Fundamentals of Production Management: Production Planning and Control (PPC)-Concepts and functions, Long & short run problems

Marketing Management: Definition, functions and market segmentation

UNIT-IV (9)

Financial Management: Introduction, Sources of finance-internal and external

Human Resource Management: Introduction, importance, selection, recruitment, training, placement, development

Legal Issues in Entrepreneurship: Mechanisms for resolving conflicts; Industrial laws- IndianFactories Act, Workmen Compensation Act; Intellectual Property Rights (IPR) – patents, trademarks, and copyrights

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Textbooks:

[1]. Robert D.Hisrich, Michael P. Peters, "Entrepreneurship", *Tata McGraw-Hill*, 9th Edition 2014 (Chapters 1,2,4,5,6,7,8,11 and13).

Reference Books

[1] David H. Holt, "Entrepreneurship New venture creation" *Prentice Hall of India*.2004.

[2] Handbook for "New Entrepreneurs", *Entrepreneurship Development Institute of India*, Ahmadabad.
[3] T.R. Banga, "Project Planning and Entrepreneurship Development", *CBS Publishers*, New Delhi,1984.
[4] Personnel efficiency in Entrepreneurship Development-"A Practical Guide to Industrial Entrepreneurs", *S. Chand & Co.*, New Delhi.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.
Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.
Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

Upon completion of this course, students will be able to…

CO1: describe characteristics of entrepreneur and his role in economic development
CO2: apply creative problem solving methods to real time situations
CO3: explain the functions of production and marketing managements
CO4: identify the legal issues in entrepreneurship and explain intellectual property rights

Course Articulation Matrix (CAM): U18OE803C ENTREPRENEURSHIP DEVELOPMENT														
Course Outcomes		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE803C.1													-	-
CO2	U18OE803C.2													-	-
CO3	U18OE803C.3													-	-
CO4	U18OE803C.4													-	-
U18OE803C														-	-

U18OE803D FOREX & FOREIGN TRADE

Class: B.Tech., VIII-Semester

Branch: ME, CSE, IT, CE, EEE, ECE, EIE

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on….

LO1: business, business system, objectives and types of companies
LO2: fundamentals of foreign trade and EXIM procedure
LO3: foreign exchange rate and methods of payments
LO4: foreign exchange control

UNIT–I (9)

Business: Nature and scope, classification of business activities, functions of commerce and trade

Business System: Characteristics and components of business system, objectives of business, classification of business objectives; types of business

UNIT-II(9)

Foreign Trade: Introduction of international trade, reasons for external trade, special problems of Foreign Trade; EXIM-objectives, roles of EXIM in foreign trade, stages in import procedure, stages in export procedure-bill of lading, mate's receipt, certificate of origin

Corporations Assisting Foreign Trade: State trading corporation of India, export credit and guarantee corporation, minerals and metals trading corporation of India

UNIT–III (9)

Foreign Exchange Rate: Meaning and importance of foreign exchange rate, methods of foreign payments; exchange rates- spot, forward and cross rates; demand and supply of foreign exchange rate, equilibrium rate of foreign exchange, theories of determining foreign exchange rate, international parity condition - balance of payments

Foreign Exchange Markets: Functions of exchange markets, components and players in exchange markets; FEMA-objectives and its role in foreign trade

UNIT–IV (9)

Foreign Exchange Control: objectives, characteristics, advantages and disadvantages, Methods: intervention, exchange restriction, multiple exchange rates, exchange clearing agreements, method of operation, exchange clearing agreements in practice, payments agreements, transfer moratoria; indirect methods

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Textbooks:

[1] C.B. Guptha, *Business Organization & Management,* 15th ed. New:SultanChand & Sons,2015(*Units 1,5*)

[2] M.L. Seth*, Macro Economics,* 22nd ed. New Delhi; Lakshmi Narayan Agarwal Publishers*,* 2014.

[3] M.C. Vaish, Ratan Prakashan Mandir, *Monetary Theory,* 16th ed. New Delhi: Vikas Publications,2016

Reference Books:

[1] Y.K.Bhushan, *Business Organization and Modern Management*, 15th ed., New Delhi : Sultan & Sons Publishers,

2014.
[2] S.A. Sherlekhar, *Business Organization and Management*, Himalaya Publishing House, 2000.
[3] K.P.M. Sundaram, *Money Banking, Trade & Finance* , New Delhi : Sultan & Sons Publishers.
[4] P.N.Chopra, *Macro Economics*, Ludhiana: Kalyani Publishers.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page.
Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page.
Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

Upon completion of the course, the student will be able to…

CO1: evaluate the objectives and types of industries and companies.
CO2: assess the procedure in imports and exports
CO3: analyse the foreign exchange rate and methods of foreign payments
CO4: Adapt the methods of exchange control

Course Articulation Matrix (CAM): U18OE803D FOREX AND FOREIGN TRADE

Course Outcomes		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE803D.1	-	-	-	-	-	-	-	-	-	2	2	-	-	-
CO2	U18OE803D.2	-	-	-	-	-	-	-	-	-	2	2	-	-	-
CO3	U18OE803D.3	-	-	-	-	-	-	-	-	-	2	2	-	-	-
CO4	U18OE803D.4	-	-	-	-	-	-	-	-	-	2	2	-	-	-
U18OE803D		-	-	-	-	-	-	-	-	-	2	2	-	-	-

U18EE804 MAJOR PROJECT WORK PHASE-II

Class: B.Tech., VIII-Semester

Branch: Electrical and Electronics Engineering

Teaching Scheme:

L	T	P	C
-	-	14	7

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

The major project work will develop students' knowledge on /in…

LO1: real-world complex engineering problems, literature review, problem formulation; and experimental and data analysis techniques

LO2: design/development of solutions to real-world engineering problems; conduct of investigations of complex problems; modern tool usage to design, build and test a prototype; impact of solution in society, environment and sustainability contexts

LO3: ethics, team work and project management skills such as budgeting, scheduling

LO4: oral, written and multimedia communication skills; self-directed independent learning and life-long learning

1. **Major project work shall be continued in 8th semester as major project *phase-II*:** All the major project teams shall take the *phase -I* work forward and complete the remaining work as *Phase-II* in the 8th semester.
2. Final Year Major Project work represents the culmination of study towards the B. Tech degree. **Major project offers an opportunity to integrate the knowledge acquired from various courses and apply it to solve real-world complex engineering problems**. The **student learning assessment process** (SLAP) shall include good number of presentations, demonstration of work undertaken, submission of a project report, writing project paper in scientific journal style & format, preparing project poster and creating video pitch on the complete project
3. Activities of major project SLAP shall be planned in such a way to ensure that the students acquire the essential knowledge, skills and qualities (KSQ) of a professional engineer.
4. **Team work:** Major project work is a team work
   (i) The students of a project team shall work together to achieve a common objective.
   (ii) Every student of a project team is expected to function effectively as an individual, and also with others as a team member in an ecosystem of team having knowledge diversity, gender diversity, social and cultural diversity among its members.
5. Every student is expected to put approximately **168 hours of work** into the major project *phase-II* course over the 12 weeks of 8th semester.
6. **Major project work *Phase-II*: 8th semester**
   (i) The convener DPEC shall release complete schedule of *phase-II* CIE during last week of 7th semester (*well in advance before start of 8th semester*), immediately after completion of progress presentation-I, so that student teams would complete the scheduled works during inter-semester break and get ready with informative, confident and comfortable presentation for progress presentation-II.
   (ii) **The project supervisors**: The project supervisors are expected to guide the students to systematically continue the *phase-I* work, useful work during inter-

semester break, meeting the deadlines as proposed in project timeline.

(iii) **The project supervisors shall ensure students focus on the project objectives and expected deliverables**

(iv) **The project supervisors shall ensure students have sufficient resources for successful project completion.**

(v) **The project supervisors shall continue guiding students on**

(a) *Knowledge, skills and qualities (KSQ) of a professional engineer to be acquired* to propose solutions and design the systems to the identified real-world problems.

(b) *Problem analysis* - to identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

(c) *Applying engineering knowledge* - to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

(d) *Design/development of solutions* - to design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental Considerations

(e) *Conduct investigations of complex problems* - to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

(f) *Modern tool usage* – to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

(g) *Engineering and society* – to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

(h) *Environment and sustainability* – to understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development

(i) *Ethics* – to apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice

(j) *Individual and team work* – to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

(k) *Communication* – to communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

(l) *Project management and finance* – to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

(m) *Life-long learning* – to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

(vi) **<u>The project supervisors are also expected to continuously emphasize and guide the students on</u>**

(a) **Following project timeline**: completing the tasks as planned in project timeline

(b) **<u>Meeting Cadence:</u>**

i. **Regular meetings with supervisor:** Short and frequent meetings increase a team's work momentum. Regular meetings with supervisor to review the status of project are very essential. All students of the team shall participate in discussions and take notes.

ii. **Meeting Frequency: Semi-weekly cadence,** i.e., the meeting frequency shall be **twice a week.** Due weightage will be given to meeting cadence and considered for evaluation during presentations,
i.e., number of planned meetings and number attended by students

(c) **Project Log Book:** The activity journaling in project log book is very important for a successful project.

i. Project log book is a written record showing the daily project activity on project goals from the very first thing like starting the project (an introduction statement what the project is all about), to the completion of the work (including the final results, and whether project met the core objectives / outcomes, etc.).

ii. In project log book, the activities like regular meetings with project supervisor, and work carried out on daily/weekly basis are to be recorded. This ensures that the student progress is being monitored well.

iii. The project supervisor shall regularly check the log book of every student of project team and endorse each and every activity by affixing his signature with date. With this, the number of planned meetings and number attended by the students will be also monitored.

iv. Log books are to be shown during all presentations and will be graded along with the project.

v. At the conclusion of the project work *phase-II*, the supervisor shall specifically comment, in the project log book, on whether the project team met each of the project work outcomes and to give evidence which describes the quality of work. For project teams, this also serves as self-assessment.

(d) **Writing down whatever is done and making notes of whatever is read**. Writing down the procedures / models followed, designs made, experiments conducted, simulations carried out, intermediate results obtained, ***difficulties faced and how they were fixed*** are very important. This kind of documenting the whole process as we go with project implementation is a very effective way and will help preparing a well-documented report having original content. Note down and include information about all the resources that you used, magazines, Journals, patents, books, and so on. This information will be needed for the bibliography in your project report. On the other hand, documenting a report ***on the spur of the moment*** would end up copying things from other sources resulting in a plagiarized document.

(e) The relevant knowledge, skills and qualities (**KSQ**) an engineering graduate should possess, which can be specially acquired by participating in major project work

(f) **Good and sufficient literature review**: Literature review is a description and analysis of information related to the topic of project work. Reading good number of review articles, research articles published in recent issues of peer reviewed journals, technical magazines, patents, reference books on the topics of potential interest, will help one understand what has already been discovered and what questions remain to identify gaps in the literature.

(g) Completing the proposed work by the end of *phase-II*

(h) Right conduct of research to promote academic integrity, honesty and time management

(i) Preparing a well-documented overall project report in proper format, covering the complete work carried out during both the phases (*phase-I and phase-II*).

(j) Consequences of plagiarism, and use of anti-plagiarism software to detect plagiarism in the report

(k) Submission of major project work report within acceptable plagiarism levels, as per the ***Anti-plagiarism policy-2020 of our institute***

(l) **Video pitch on complete project work**: Capturing short videos, photos, screenshots on experiments conducted, simulations carried out, prototype / working model / process / software package / system developed during course of project execution, photos showing interaction with supervisor for creating a short video pitch on the complete work done during both phases (*phase-I and phase-II*).

(m) **Project Paper**: Writing a technical paper at the end of *phase-II* based on the solution(s) proposed, results obtained and prototype / working model / process / software package / system developed, for submission to a reputed non-predatory conference/non-paid peer reviewed journal.

(n) **Project poster**: At the end of phase-II, the project teams shall have to present their project in the form of posters, at the time of demonstration of complete porotype / working model / software package / system developed.

(vii) **Phase – II evaluation**: There shall be only Continuous Internal Evaluation (CIE) for major project work *phase-I* with following components

(a) **Progress Presentation -II** *(during third / fourth week of 8^{th} semester):* The progress presentation-II shall include the identified problem, objective(s), literature review, expected outcome(s), results of work done as per project plan timeline.

i. **Following project timeline**: The project timeline shall be meticulously followed and the tasks shall be completed as planned in project timeline.
ii. 80-85% of work is expected to be completed
iii. Project teams shall compulsorily show the following as part of their progress presentation-II
    1. *The slides on project timeline and*
    2. *A table showing targeted tasks as per timeline and status – whether tasks*

accomplished?

iv. **Project log book**: Every student of the Project team shall compulsorily show the activity journaling in the log book (with due signatures of project supervisor) during presentations

(b) **Final Presentation** *(during penultimate week of 8th semester):* **Project supervisor shall ensure that the project team has accomplished 100% of work proposed**. The project team shall

i. **Follow project timeline**: The project timeline shall be meticulously followed and the tasks shall be completed as planned in project timeline.

ii. compulsorily show the following as part of their final presentation
   1. *The slides on project timeline and*
   2. *A table showing targeted tasks as per timeline and whether all the identified tasks accomplished?*

iii. **show project log book**: Every student of the Project team shall compulsorily show the complete activity journaling in the log book (*with due signatures of project supervisor*)

iv. present complete results & analysis

v. **demonstrate the completed project**: working model / process / software package / system developed

vi. demonstrate the completed project with the **project poster presentation**

(viii) **Evaluation for Major project phase-II:**

There shall be continuous internal evaluation (CIE) and end semester examination (ESE). The evaluation for *phase-II* shall be as given below:

Assessment	Weightage
A. CIE **(i) Supervisor Assessment (10%)** **(ii) DPEC Assessment (50%)** *(a) Progress presentation-II (10%)* *(b) Final presentation (10%)* *(c) Working model / process / software package / system developed (20%)* *(d) Project video pitch (5%)* *(e) Project paper (5%)*	**60%**
B. ESE *(i) Well-documented project report (15%)* *(DPEC shall evaluate the project reports, as per the rubrics, well before the ESE. At the time of ESE, evaluated project report marks shall be posted in the award list, along with the ESE oral presentation marks. Students shall appear for Viva-Voce with project report)* *(ii) Oral presentation with PPTs and viva-voce (15%)* *(iii) Project poster (5%)* *(DPEC shall evaluate the project poster, as per the rubrics, well before the ESE. At the time of ESE, evaluated project poster marks shall be posted in the award list. Students shall appear for Viva-Voce with project poster)*	**40%**
Total Weightage	**100%**

(a) **Working Model:** Every project team shall be required to develop a working model/ process/software package/system, on the chosen work. The completed working model/ process/software package/system shall be demonstrated during final presentation at the end of *phase-II*.

(b) **Video pitch**: Every project team shall be required to create a pitch video, which is a video presentation on their major project work *phase-I & phase-II*. The project team shall present the produced video pitch during Final presentation. The produced video pitch should

- **(i)** be 3 to 5-minute-long video (no longer than 5 minutes)
- ***(ii)*** be concise and to the point, on the problem, proposed solution and its salient features.
- **(iii)** show project timeline and sample page of log book
- **(iv)** highlight the various stages during project implementation with the help of short videos / photos / screenshots on experiments conducted, simulations carried out, prototype / working model / process / software package / system developed as part of proposed solution and also photos showing team interactions with supervisor and the team working in the lab on project.
- ***(v)*** discuss the impact of proposed solution in *ethical, environmental, societal and sustainable development contexts.*
- ***(vi)*** emphasize key points about *business idea, potential market for the proposed solution*

(c) **Project poster**: At the end, the project teams shall present their project in the form of posters (A2 size). The teams shall have to present their work during the poster presentation session scheduled at the end of the 8th semester, at the time of demonstration of complete porotype / working model / software package / system developed.

(d) **Well-documented plagiarism-cleared project report**: Every project team shall be required to submit a well-documented project report on the work carried out, as per the format specified by the DPEC. The report should clear plagiarism check as per the anti-plagiarism policy-2020 of the institute. The following shall compulsorily be included in the Results-Chapter of the project report

- (i) Photos / screen shots taken at various stages during the development of working model/ process/software package/system as part of Results-Chapter
- (ii) Snapshot of final working model/ process/software package/system developed
- (iii) Pictures of the team working in the lab, the team discussing with the project supervisor, working on creative project, or an event they are attending for work.
- *(iv) All these photos / screen shots shall be properly referred in the project report by assigning figure numbers*

(e) **Tangible outcomes of project work in Conclusions - Chapter:** These are the lessons learnt from doing a project work. The students have to describe in their own words what they learnt from the project work experience. They have to describe what specific KSQs are acquired by them, with reference to the expected COs, after successful completion of major project work. Finally, a table depicting systematic mapping of what they have learnt and the expected major project work COs, is to be shown in the conclusions chapter.

(f) **Student feedback on major project in Conclusions - Chapter: To gather** information on whether project work was useful and gave practical experience on chosen field of interest, and other learning, a well-defined feedback questionnaire (*made available by the dept*) with closed and open questions shall be kept in the conclusions chapter of the project report.

(ix) It is mandatory for

(a) every student of the team to appear for ESE oral presentation and viva-voce, to qualify for course evaluation

(b) every project team to write a technical paper based on the solution(s) proposed, results obtained and prototype / working model / process / software package / system developed, for submission to a reputed non-predatory conference/non-paid peer reviewed journal

(c) every project team shall be required to create a pitch video, which is a video presentation on their major project work *phase-I & phase-II*

(d) every project team shall present their project in the form of a poster, during the demonstration of complete porotype / working model / software package / system developed

(xi) The student has to register for the Major project work *phase-II* as supplementary examination in the following cases:

(a) he/she is absent for oral presentation and viva-voce as part of ESE presentation

(b) he/she fails to fulfill the requirements of Major project work *phase-II* evaluation as per specified guidelines

(xii) Supplementary examination for Major project work *phase-II*

(a) The CoE shall send the list of students, registered for supplementary examination, to the HoDs concerned

(b) The DPEC, duly constituted by the HoD, shall conduct Major project *phase-II* supplementary exam and send the award list to the CoE within the stipulated time

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Course Learning Outcomes (COs):

Upon completion of the major project work, students will be able to…

CO1: review research literature, formulate problem, apply knowledge of mathematics, sciences, engineering fundamentals, experimental and data analysis techniques; synthesize technical knowledge and innovative approaches to generate suitable solutions for real-world complex engineering problems (Technical skills)

CO2: design a system or product based on product/customer specifications; develop, analyze, and critically evaluate the design alternatives in order to justify the solutions to a real-world problem guided by ethical, environmental, societal and sustainable development considerations; use modern engineering and IT tools to design, build and test a prototype within specified project timeline and budget (Problem solving and critical thinking skills)

CO3: apply project management and organizational skills; demonstrate integrity, leadership, creativity, professional and ethical responsibilities as an individual and as a member or leader to produce time-sensitive deliverables in a multi-disciplinary team (Ethics and teamwork)

CO4: collate the results, compare performance of prototype to design specifications and present clearly and effectively the proposed solution, conclusions and/or recommendations in written (report, poster, technical paper), oral (presentations) and multimedia formats (video pitch) and engage in self-directed independent learning and life-long learning demonstrating the KSQ of a professional engineer (Communication skills and life-long learning)

Course Articulation Matrix (CAM) : U18EE804 MAJOR PROJECT WORK PHASE-II

CO	CO Code	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE804.1	2	2	2	2	-	-	-	3	-	2	-	3	2	2
CO2	U18EE804.2	1	2	2	-	2	2	2	3	-	-	-	3	2	2
CO3	U18EE804.3	-	-	-	-	-	-	-	3	2	-	2	3	2	2
CO4	U18EE804.4	-	-	2	2	-	-	-	3	-	2	-	3	2	2
U18EE804		**1.5**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**3**	2	2