CURRICULUM

(Scheme of Studies and Examinations for 03rd-04th semesters,
w.e.f. academic year 2019-20)

for

UNDERGRADUATE DEGREE
(B.Tech.) COURSE

IN

ELECTRICAL ENGINEERING

[Scheme for 3rd & 4th sems. to be adopted in 2019-20]

DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE AND TECHONOLOGY
(Established Under Haryana Legislature Act NO. 29 of 2006
And Approved by U.G.C. under Sections 2(f) and 12(B) of U.G.C. Act, 1956
NBA Accredited Department and NAAC 'A' grade University)
Murthal-131039, Sonipat (Haryana)
www.dcrust.ac.in

B. Tech. 3rd Year (V & VI semester only) Electrical Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)

B.Tech. 2nd YEAR ELECTRICAL ENGINEERING (SEMESTER – III)
Choice Based Credit System Scheme Of Studies & Examinations w.e.f. 2019-20

Sl. No.	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credits	Duration of Exam.
							Theory	Practical			
			L	T	P						
1	EE201C	Electrical Circuit Analysis	3	1	0	25	75	0	100	4	3
2	EE203C	Semiconductor Devices and Circuits	3	1	0	25	75	0	100	4	3
3	EE281C	Semiconductor Devices and Circuits Laboratory	0	0	2	25	0	75	100	1	3
4	EE205C	Electrical Machines-I	3	1	0	25	75	0	100	4	3
5	EE283C	Electrical Machines-I Laboratory	0	0	2	25	0	75	100	1	3
6	EE207C	Measurements and Instrumentation	3	1	0	25	75	0	100	4	3
7	EE285C	Measurements and Instrumentation Laboratory	0	0	2	25	0	75	100	1	3
8	ME201C	Engineering Mechanics (Common with ME, Auto and EEE)	3	1	0	25	75	0	100	4	3
9	MC203C MC201C	Constitution of India (Gr. A) Environment Studies (Gr. B)	3	0	0	25	75	0	100	0	3
Total			**18**	**05**	**06**	**225**	**450**	**225**	**900**	**23**	**27**

L= Lecture, T = Tutorial, P = Practical, & MC = Mandatory Course (Audit)

1. All the branches are to be divided into groups 'A' and 'B' as per the suitability of the institute/college, so that there is an equitable distribution of teaching load in odd and even semesters.
2. For DCRUST Murthal: GROUP A: BME, BT, CSE, ECE. GROUP B: CE, CHE, EE, ME.
3. The Environmental studies (GES201B) and Environmental Studies Field Work (GES203B) are compulsory & qualifying courses.
4. The students will be allowed to use non-programmable scientific calculator in the examination. However, Sharing / exchange of calculator is prohibited in the examination.
5. Electronics gadgets including Cellular phones are not allowed in the examination.

DeenbandhuChhotu Ram University of Science & Technology, Murthal (Sonepat)
B.Tech. 2nd YEAR ELECTRICAL ENGINEERING (SEMESTER – IV)
Choice Based Credit System Scheme Of Studies & Examinations w.e.f. 2019-20

Sl. No.	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credits	Duration of Exam
			L	T	P		Theory	Practical			
1	EE202C	Logic and Sequential Circuits	3	1	0	25	75	0	100	4	3
2	EE280C	Logic and Sequential Circuits Laboratory	0	0	2	25	0	75	100	1	3
3	EE204C	Electrical Machines – II	3	1	0	25	75	0	100	4	3
4	EE282C	Electrical Machines- II Laboratory	0	0	2	25	0	75	100	1	3
5	EE206C	Power Systems – I	3	0	0	25	75	0	100	3	3
6	EE284C	Power Systems Laboratory – I	0	0	2	25	0	75	100	1	3
7	EE208C	Signals and Systems	3	0	0	25	75	0	100	3	3
8	MATH203C	Mathematics – III (Probability and Statistics)	3	1	0	25	75	0	100	4	3
9	BT221C	Biology for Engineers (Common with EE and EEE)	3	0	0	25	75	0	100	3	3
10	MC201C MC203C	Environment Studies (Gr. A) Constitution of India (Gr. B)	3	0	0	25	75	0	100	0	3
Total			**21**	**04**	**06**	**250**	**525**	**225**	**1000**	**24**	**30**

L= Lecture, T = Tutorial, P = Practical, & MC = Mandatory Course (Audit)

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2. For DCRUST Murthal: GROUP A: BME, BT, CSE, ECE. GROUP B: CE, CHE, EE, ME.
3. The Environmental studies (GES201B) and Environmental Studies Field Work (GES203B) are compulsory & qualifying courses.
4. The students will be allowed to use non-programmable scientific calculator in the examination. However,sharing/exchange of calculator is prohibited in the examination.
5. Electronics gadgets including Cellular phones are not allowed in the examination.
6. At the end of 4th semester, each student has to undergo Professional Training (Level - 2) of at least 4 weeks from the industry / institute /research lab / training centre, etc. during summer vacation & its evaluation shall be carried out in 5th Semester.

B. Tech. 3rd Year (V & VI semester only) Electrical Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

EE 201C **ELECTRICAL CIRCUIT ANALYSIS**

B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)
SEMESTER-III

L	T	P	Credits	Class-work Marks	: 25
3	1	0	4	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes:

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

1. Apply network theorems for the analysis of electrical circuits.
2. Obtain the transient and steady-state response of electrical circuits.
3. Analyse circuits in the sinusoidal steady-state (single-phase and three-phase).
4. Analyse two port circuit behaviour.

UNIT-I

Network Theorems (10 Hours)

Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem. Analysis with dependent current and voltage sources. Node and Mesh Analysis. Concepts of duality and dual networks.

UNIT-II

Sinusoidal steady state analysis (11Hours)

Phasor Analysis, Solution of first and second order differential equations for Series and parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response to dc and sinusoidal ac. Three-phase circuits. Mutually-coupled circuits, Dot Convention in coupled circuits & Ideal Transformer.

UNIT-III

Electrical Circuit Analysis Using Laplace Transforms (8 Hours)

Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances

UNIT-IV

Two Port Network and Network Functions (6 Hours)

Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission & inverse transmission parameters and hybrid& inverse hybrid parameters, interconnections of two port networks.

Text / References:

1. M. E. Van Valkenburg, “Network Analysis”, Prentice Hall, 2006.
2. D. Roy Choudhury, “Networks and Systems”, New Age International Publications, 1998.
3. W. H. Hayt and J. E. Kemmerly, “Engineering Circuit Analysis”, McGraw Hill Education,2013.
4. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw Hill Education, 2004.

5. K. V. V. Murthy and M. S. Kamath, “Basic Circuit Analysis”, Jaico Publishers, 1999.

NOTE:

1.For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 6-7 short answer type questions, will be compulsory & based on the entire syllabus. Rest of the eight questions are to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit. All questions will carry equal marks.

2.The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

NOTE: For examiner for paper setting:-

In semester examinations, examiner is required to set up question paper covering the entire syllabus in accordance with the examination reforms circulated by the AICTE & approved under item No. 14_18 of academic council.

EE203C SEMICONDUCTOR DEVICES AND CIRCUITS

B.TECH. (ELECTRICAL ENGINEERING, EEE,IC)
SEMESTER-III

L	T	P	Credits	Class-work Marks	: 25
3	1	0	4	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

Course Outcomes:

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

1. Understand the characteristics of transistors.
2. Design and analyse various rectifier and amplifier circuits.
3. Design sinusoidal and non-sinusoidal oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.

UNIT-I

Diode circuits (4 Hours)

P-N junction diode, I-V characteristics of a diode; Performance analysis of half-wave and full-wave rectifiers, Zenerdiodes, clamping, clipping and regulator circuits.

BJT circuits (8 Hours)

Structure and I-V characteristics of a BJT; Biasing circuits. BJT as a switch. BJT as an amplifier: small-signal model,common-emitter, common-base and common-collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits.

UNIT-II

JFET &MOSFET circuits (8 Hours)

JFET &MOSFET structure and I-V characteristics, Biasing circuits. MOSFET as a switch. MOSFET as an amplifier: small-signal model and common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit.

UNIT-III

Power and operational amplifiers (8 Hours)

Power amplifier; ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, CMRR, gain bandwidth product), differential amplifier.

UNIT-IV

Application of op-amp:

Linear applications of op-amp (8 Hours)

Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, instrumentation amplifier, differentiator, integrator, active filter, oscillators, (Wein bridge and phase shift).

Nonlinear applications of op-amp (6 Hours)

Comparator, Zero Crossing Detector, Schmitt trigger ckt., Square-wave and triangular-wave generators, peak detector.

Text/References:

1. A. S. Sedra and K. C. Smith, “Microelectronic Circuits”, New York, Oxford University Press, 1998.
2. J. V. Wait, L. P. Huelsman and G. A. Korn, “Introduction to Operational Amplifier theory and applications”, McGraw Hill U. S., 1992.
3. J. Millman and A. Grabel, “Microelectronics”, McGraw Hill Education, 1988.
4. P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1989.

5. P.R. Gray, R.G. Meyer and S. Lewis, “Analysis and Design of Analog Integrated Circuits”, John Wiley & Sons, 2001.

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1.For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 6-7 short answer type questions, will be compulsory & based on the entire syllabus. Rest of the eight questions are to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit. All questions will carry equal marks.

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NOTE: For examiner for paper setting:-

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EE281C **SEMICONDUCTOR DEVICES AND CIRCUITS LABORATORY**

B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)

SEMESTER-III

L	T	P	Credits	Class-work Marks	: 25
0	0	2	1	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

COURSE OUTCOMES:

Through this course, the students:

1. Acquire a basic knowledge in solid state electronics including diodes, MOSFET, BJT, and operational amplifier.
2. Develop the ability to analyze and design analog electronic circuits using discrete components.
3. Observe the amplitude and frequency responses of common amplification circuits.
4. Design, construct, and take measurement of various analog circuits to compare experimental results in the laboratory with theoretical analysis.

LIST OF EXPERIMENTS:

1 To calculate efficiency of half wave and full wave rectifiers
2 Design power supply filter.
3 To drawn the characteristic of diode as a clipper and clamper.
4 To Realize zener diode as a voltage regulator.
5 To design CE amplifier for voltage, current and Power gains input, output impedances.
6 To use CC amplifier as a buffer.
7 To plot frequency response of RC coupled amplifier.
8 To design constant current source by using transister CE configuration .
9 To plot characteristics of FET.
10 To Design FET common source amplifier.
11 Design of FET common drain amplifier.
12 Graphical determination of small signal hybrid parameter of bipolar junction transistor.
13 To Study and design of a DC voltage doubler.
14 To perform at least three out of above experiments on NI Elvis board.

Note:-

1 Total ten experiments are to be performed in the semester.
2 At least seven experiments should be performed from the above list. Remaining three experiments should be performed as designed and set by the concerned institution as per the scope of the syllabus.

EE205C **ELECTRICAL MACHINES-I**

B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)

SEMESTER-III

L	T	P	Credits	Class-work Marks	: 25
3	1	0	4	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

Course Objectives:

This subject aims to introduce to students to give detailed knowledge of magnetic field & magnetic circuits, DC Machines, 1-Phase and 3-Phase transformers.

Course Outcomes:

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

1. Understand the concepts of magnetic circuits.
2. Understand the operation of dc machines.
3. Analyse the differences in operation of different dc machine configurations.
4. Analyse single phase and three phase transformers circuits.

Unit-I

Magnetic fields and magnetic circuits (5 Hours):

Review of magnetic circuits - MMF, flux, reluctance, inductance; review of Ampere Law and Biot-Savart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil - through air gap and through a combination of iron and air; influence of highly permeable materials on the magnetic flux lines.

Electromagnetic force and torque (6 Hours):

B-H curve of magnetic materials; flux-linkage vs current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with respect to angular position of a rotating element. Examples - galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency

Unit-II

DC Machines (10 Hours):

Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation - Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation, Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction, effect and mitigation.

Types of field excitations - separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed, V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors.

Unit-III

DC machine (4 Hours):

Starting, braking and speed control of DC motors. Losses, load testing and back-to-back testing of DC machines.

Transformers (6 Hours):
Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing of single phase and three phase transformer - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses.

Unit-IV

Transformers (10 Hours):
Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers. Cooling of transformers, Three-phase transformer-construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers,

Text / References

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
4. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
5. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

NOTE:

1.For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 6-7 short answer type questions, will be compulsory & based on the entire syllabus. Rest of the eight questions are to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit. All questions will carry equal marks.

2.The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

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EE283C ELECTRICAL MACHINES-I LAB

B.TECH. (ELECTRICAL ENGINEERING, EE)

SEMESTER-III

L	T	P	Credits		
0	0	2	1	Class-work Marks	: 25
				Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

Course Outcomes:

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

1. Understand the basic operation of Electrical machines
2. To Analyse various tests on Electrical machines
3. To Design some test circuits for Electrical Machines
4. To understand and analyse design parameters of transformers

LIST OF EXPERIMENT

1. To perform load test on DC shunt motor and determine performance characteristics
2. To perform load test on DC shunt generator.
3. To determine efficiency of DC shunt Machine by Hopkinson's test.
4. To study speed control of DC shunt motor by field control and armature control method.
5. To study Ward Leonard method of speed control of D.C. motor.
6. To find turns ratio & polarity of a 1-phase transformer.
7. To perform open & short circuit tests on a 1-phase transformer, and determine transformer parameter and efficiency at different loads.
8. To separate the hysteresis and eddy current losses of a Transformer.
9. To perform Sumpner's back to back test on 1-phase transformers.
10. To perform Parallel operation of two 1-phase transformers.
11. To perform Parallel operation of two 3-phase transformers.
12. To convert three phase to two-phase By Scott-connection.

NOTE:

1. The students will be required to perform at least 8 experiments/exercises from the above list and any other experiments designed on the basis course.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/ex-change of calculator are prohibited in the examinations.
3. Electronic gadgets including cellular phones are not allowed in the examination.

EE207C **MEASUREMENTS AND INSTRUMENTATION**

B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)

SEMESTER-III

L	T	P	Credits	Class-work Marks	: 25
3	1	0	4	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

COURSE OUTCOMES:

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

1. Learn about various measurement instruments for measurement of Voltage, Current, Power, Power Factor & Frequency, their construction, operating principle, limitations, etc.;
2. Understand statistical data analysis & errors in instruments;
3. Analyse the static characteristics of instruments
4. Understand the measurement of parameters & variables with the help of D.C. & A.C. bridges.

UNIT- I

Fundamental Concepts Relating to Measurements: True Value, Static Characteristics of Instruments (Accuracy, Precision, Resolution, Threshold, Sensitivity, Drift, Hysteresis & Dead-band, Dead Time); Classification of Instruments (Absolute & Secondary Instruments; Indicating, Recording & Integrating instruments); Generalized Instrument (Block diagram, description of blocks); Three forces in Electromechanical indicating instruments; Comparison of damping methods & their suitability; Scale information.

Errors in Measurements (Gross, Systematic, Random); Basic statistical analysis applied to measurements: Mean, standard deviation, Six-sigma estimation, C_p, C_{pk}, process capability indices.

UNIT- II

MEASURING INSTRUMENTS FOR VOLTAGE & CURRENT: Construction, Operating Principle, torque equation, Shape of scale, use as Ammeter or as Voltmeter (Extension of Range), Use on AC/DC or both, Advantages & disadvantages, Errors (Both on AC/DC) of PMMC types, Electrodynamic Type, Moving iron type (attraction, repulsion & combined types), & Induction type instruments, Instrument Transformers(C.T. & P.T.)

UNIT- III

WATTMETERS & ENEGRY METERS: Construction, operating principle, Torque equation, Shape of scale, Errors, Advantages & Disadvantages of Electrodynamic& Induction type Wattmeters; Single phase induction type Energy meter, Compensation & creep in energy meter.

POWER FACTOR & FREQUENCY METERS: Construction, operation, principle, Torque equation, Advantages & disadvantages of Single phase power factor meters (Electrodynamic& Moving Iron types) & Frequency meters (Electrical Resonance Type: Ferrodynamic&Electrodynamic types).

UNIT- IV

MEASUREMENT OF RESISTANCES (MEDIUM, LOW & HIGH): Voltmeter-ammeter method & Substitution Method for medium range resistance measurement; Limitations of Wheatstone bridge; Four-terminal resistance; Kelvin's double bridge method for low resistance measurement, Difficulties in high resistance measurements; Measurement of high resistance by direct deflection & loss of charge methods, Meggar.

MEASUREMENT OF INDUCTANCE (L) & CAPACITANCE (C) & FREQUENCY BY A.C. BRIDGES: General balance equation, Circuit diagram, Phasor diagram, Advantages, disadvantages, applications of Maxwell's inductance-capacitance,De Sauty Bridge, Hays Bridge, Owen's Bridge, Schering Bridge, Wein's bridge, Anderson Bridge.

TEXT BOOK:

A text Book of Measurements & Instrumentation (With Experiments) by J.S. Saini, Pub. New Age Publishers, N. Delhi.

REFERENCE BOOKS:

1. A Course in Elect. & Electronic Measurements & Instrumentation by A. K. Sawhney; Khanna Pub.
2. Electrical Measurements by E.W. Golding & F.C. Widdis; Pub.: Reem Publications
3. Electronic & Elect. Measurement & Instrumentation by J.B. Gupta; Pub.: Kataria& Sons.
4. Electronic Instrumentation & Measurement Technique, W.D. Cooper & A.D. Helfrick; Pub.: Prentice Hall
5. Measuring Systems by Ernest O. Doebelin&Dhanesh N. Manik; Pub.: McGraw Hill.

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2.The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

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EE285C MEASUREMENTS AND INSTRUMENTATION LABORATORY

B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)

SEMESTER-III

L	T	P	Credits		
0	0	2	1	Class-work Marks	: 25
				Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

COURSE OUTCOMES:

At the end of this Laboratory course, the students will be able to have hands on experience of:

5. Various measuring instruments;
6. Understanding statistical data analysis & errors in instruments;
7. Measurement of power and power factor using different techniques;
8. Measurement of parameters & variables with the help of D.C. & A.C. bridges;
9. Storage & retrieval of waveforms/ data to & from DSO and computations therefrom.

LIST OF EXPERIMENTS

1. To measure the resistances of a batch of resistors (same-value by specifications) and estimate their statistical parameters (mean & standard deviation).
2. To measure inductance (L) by Maxwell's bridge and by an LCR meter.
3. To measure capacitance (C) by De-Sauty's bridge and by an LCR meter.
4. To measure frequency (f) by Wien's bridge.
5. To measure resistance of a four-terminal Low Resistance using Kelvin's double bridge.
6. To measure High resistance and Insulation resistance using Megger.
7. To use DSO for storage and retrieval of steady state periodic waveforms produced by a function generator. Consider selection of trigger source and trigger level, selection of time scale and voltage scale. Also alter bandwidth of measurement and sampling rate & record observations.
8. To Store & Retrieve one cycle of data of a periodic waveform from a DSO and use the values of data to compute RMS values using C or MATLAB program.
9. To use DSO to capture transients like step response of R-L-C circuit.
10. To effect current measurement using Shunt, C.T., and Hall sensor.
11. To measure power with the help of Wattmeter, C.T. & P.T.
12. To measure, using 2-wattmeter method, the (a) power in a balanced & an unbalanced 3-phase load (b) p.f. in a balanced 3-phase load.
13. To measure power &p.f. by 3-ammeter method.
14. To measure power &p.f. by 3-voltmeter method.
15. To measure high resistance by loss of charge method.

NOTE:

The students are required to perform 10 experiments, with at least 8 experiments from the above list and further two experiments either from the above list or from any other experiments designed on the basis of the corresponding theory course.

ME201C ENGINEERING MECHANICS
B.TECH. (Common with Mech. Engg. and Elecrical &Electronics Engg.)

SEMESTER-III

L	T	P	Credits	Class-work Marks	: 25
3	1	-	4	Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

UNIT-I

REVIEW OF BASIC FORCE SYSTEMS: Dimensions and units of mechanics, idealization of mechanics, laws of mechanics, vector algebra review, moment of a force about a point and axis, the couple and couple moment, addition and subtraction of couples, moment of a couple about a line, translation of a force to a parallel position, resultant of a force system, equivalent force, Friction-static and dynamics, Problems.

EQUILIBRIUM: Introduction, free body diagram, control volumes, general equations of equilibrium,

two point equivalent loading, static in-determinacy, simple truss, method of joints, method of sections, Problems.

UNIT-II

PROPERTIES OF SURFACES, MOMENTS AND PRODUCTS OF INERTIA : First moment of an area and the centroid, principal axes, formal definition of inertia quantities, relation between mass-inertia terms and area-inertia terms, translation of coordinate axes, transportation properties of the inertia terms, a brief introduction to tensors, the inertia of ellipsoid and principal moments of inertia, Problems.

UNIT-III

KINEMATICS OF PARTICLES AND RIGID BODIES: Velocity and acceleration in path andcylindrical coordinates, motion of a particle relative to a pair of translating axes, inertial and non inertial frame of reference, centripetal and coriolis acceleration , definition and motion of a rigid body in the plane, translation and rotation in the plane, Chasles theorem, kinematics in a coordinate system rotating and translating in the plane, angular momentum about a point of a rigid body planar motion; Euler's laws of motion , Problems.

UNIT-IV

PARTICLE DYNAMICS, ENERGY & MOMENTUM METHODS: Newton's law for rectangular coordinates & cylindrical coordinates, Newton's law for path variables, work energy equations, work energy equations for a systems of particles, linear and angular momentum equations for a systems of particles. Conservation of angular momentum, Problems.

TEXT BOOK:

1. Engineering Mechanics - Statics & Dynamics by R.C. Hibler Pearson.
2. Engineering Mechanics - Statics & Dynamics by I.H. Shames, PHI, New Delhi
3. Engineering Mechanics – Timoschenko.

REFERENCE BOOKS:

1. Statics & Dynamics by J.L. Meriam, JohnWiley& Sons (P) Ltd. New York.
2. Statics & Dynamics by Beer & Johnson, MGH, New Delhi.

Note:

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

   For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

MC203C CONSTITUTION OF INDIA
B.TECH. (Semester III/IV) Category: Humanities

L	T	P	Credits	Class-work Marks	: 25
3	0	0	0	Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

Course Objectives:

To make students conscious citizens of India and well equip them to explain and understand the importance of constitution of the country

Course Contents:

Unit I

Philosophy of Indian Constitution

Ideological Basis and Salient Features of Indian Constitution
Fundamental Rights & Duties of the Citizens
Directive Principles of State Policy

Unit II

Nature and Dynamics of Indian Federalism

Federalism: Theory and Practice in India
Federal Features of the Indian Constitution
Legislative, Administrative and Financial Relations between the Union and the States

Unit III

Union and State Legislature

Parliament: Composition, Functions and Working of the Parliamentary system
State Legislature: Composition and Functions of Vidhan Sabha/ Vidhan Parishad

Unit IV

Centre and State: Executive and Judiciary

President, Prime Minister and Council of Ministers
Governor, Chief Minister and Council of Ministers
Judiciary: Supreme Court; High Court

Course Outcomes:

At the end of the course students will be able to

1. To understand basic features of the constitution and rights and duties of Indian citizens
2. To understand the basic structure of Centre and State Government
3. To get acquainted with the nature of parliamentary form of Government
4. To have knowledge of the executive and judiciary powers in Indian democratic set-up

Scheme of End Semester Examinations (Major Test):

1. The duration of examinations will be three hours.
2. Nine questions of 15 marks each will be set out of which the students will have to attempt five questions in all.
3. First question of 15 marks will be compulsory. It will cover all the four units of the syllabus. The nature of the questions in each unit will depend upon the nature of content therein. The questions may have sub-parts with marks assigned against each.
4. Question No 02 to 09 of 15 marks each will be set from the four units of the syllabus --- two from each unit.
5. In addition to first compulsory question the students will have to attempt four more questions, selecting one from each unit.

Recommended Readings:

1. Austin G., *The Indian Constitution: Corner Stone of a Nation*, New Delhi: Oxford University Press, 1966
2. Basu D.D., *An Introduction to the Constitution of India*, New Delhi: Prentice Hall, 1994
3. Kothari R., *Politics in India*, New Delhi: Orient Language, 1970
4. Siwach J.R., *Dynamics of Indian Government and Politics*, New Delhi: Sterling Publishers, 1985
5. Bhambhri C.P., *The Indian State--Fifty Years*, New Delhi: Shipra, 1997
6. Ghai U.R.*, Indian Political System*, Jalandhar: New Academic Publishing Company, 2010

NOTE: For examiner for paper setting:-

In semester examinations, examiner is required to set up question paper covering the entire syllabus in accordance with the examination reforms circulated by the AICTE & approved under item No. 14_18 of academic council.

MC201C ENVIRONMENTAL STUDIES
B.TECH. (Semester III/IV) Category: Humanities

L	T	P	Credits		
3	0	0	0	Field work	: 25
				Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

UNIT I **10 lectures**

Unit 1: The Multidisciplinary Nature of Environmental Studies, .Introduction to Environment: Definition, Scope, and importance of environmental studies; need for public awareness.

Environmental Pollution: Definition, Cause and effects of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Role of an individual in prevention of pollution, Pollution case studies

UNIT- II

10 lectures

Natural Resources: Water resources: over-utilization, floods, drought, dams-benefits and problems; Mineral resources: Use and exploitation, environmental effects; Food resources : changes caused by modern agriculture, fertilizer-pesticide problems, water logging, Energy resources : Growing energy needs, renewable and non renewable energy sources; Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

UNIT –III

10 lectures

Ecosystems and Biodiversity: Concept of an ecosystem, Structure and function, Energy flow, Ecological succession, ecological pyramids. Concept of Biodiversity, definition and types, Hot-spots of biodiversity; Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

UNIT –IV

8 lectures

Social Issues and Environment: Water conservation, rain water harvesting, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, Public awareness. Population growth, variation among nations, Family Welfare Programme. Human Population and the Environment - Population growth, Population explosion, Women and Child Welfare.

Field Work - Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc
(Field work equal to 5 lecture hours)

Total : 43

COURSE OUTCOMES:

On completion of the course, the students will be able to:

1. Develop concepts of basic environmental factors.
2. Introduce to the students the basic understanding of ecosystem and its structural and functional aspects and vast biodiversity
3. Outline aspects of environmental issues.
4. Understand the knowledge of energy resources and their environmental implications

REFERNCE BOOKS:

1. **A Textbook of Environmental Studies** by Asthana D.K. and AsthanaMeera
2. **Fundamental Concepts in Environmental Studies** by Mishra D.D.
3. **Environmental Studies** by S.C Sharma M.P Poonia
4. **Textbook of Environmental Studies for Undergraduate** by ErachBharucha
5. **Environmental Studies: Third Edition** by R. Rajagopalan

NOTE:

1.For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 6-7 short answer type questions, will be compulsory & based on the entire syllabus. Rest of the eight questions are to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit. All questions will carry equal marks.

2.The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

NOTE: For examiner for paper setting:-

In semester examinations, examiner is required to set up question paper covering the entire syllabus in accordance with the examination reforms circulated by the AICTE & approved under item No. 14_18 of academic council.

EE202C **LOGIC AND SEQUENTIAL CIRCUITS**

B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)

Choice Based Credit System (effective from Session 2019-20)

SEMESTER-IV

L	T	P	Credits		
3	1	0	4	Field work	: 25
				Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

COURSE OBJECTIVES:

The main objective of this course is

1. To give the students basic knowledge of the logical operation and digital circuits.
2. Understanding the mathematical operations done in digital circuits.
3. To provide the understanding of data storage.
4. How decision making and other events take place in digital cicuits.

UNIT - I

Fundamentals of Digital Systems and logic families: Digital Signals, Digital Circuits, Logic Symbols and Truth Tables, AND, OR, NOT, NAND, NOR and Exclusive-OR Operations, Universal Gates, Boolean Algebra, Examples of IC Gates, Bases-2, 8, 10 and 16 Number Systems (Binary, Signed Binary, Octal Hexadecimal Number),Conversion from one Base to other Base,Binary Arithmetic, Addition, Subtraction, One's and Two's Complements Arithmetic, Other Binary Codes, Error Detecting and Correcting Codes, Digital Logic Families, TTL, Schottky TTL and CMOS Logic, Interfacing CMOS and TTL, Tri-State Logic.

(12Hours)

UNIT - II

Combinational Digital Circuits: Standard Representation for Logic Functions, Fundamental Sum of Products and Product of Sum Expressions, K-Map Representation, Simplification of Logic Functions Using K-Map, Minimization of Logical Functions. Don't care Conditions, Common Combinational Logic Circuits, Multiplexer, De-Multiplexer /Decoders, Half Adders, Full Adders,Subtractors, Binary Coded DecimalArithmetic, Carry Look Ahead Adder, Serial Adder, Digital Comparator, Even and Odd Parity, Parity Checker/Generator, Code Converters, Priority Encoders, Decoders/Drivers for Display Devices, Q-M Method of Function Realization.

(12 Hours)

UNIT - III

Sequential Circuits and Systems: Binary Storage Element, A 1-bit Memory, Circuit Properties of Bi-Stable Latch, Basics of Flip-flop, Flip-Flop Operationand its types,SR and Clocked SR flip flop, J- K,T and D-types Flip-Flops, Applications of Flip-Flops, Introduction to Registers, Shift Registers, Applications of Shift Registers, Serial to Parallel Converter, Parallel to Serial Converter, General form of a Sequential Circuit, Asynchronous and synchronous Circuits, Sequence Generator, Ripple (Asynchronous) Counters, Synchronous Counters.

(12 Hours)

UNIT - IV

A/D and D/A Converters: Digital to Analog Converters: Weighted Resistor/Converter, R-2R Ladder, D/A Converter, Specifications for D/A Converters, Examples of D/A Converter lCs, Sample and Hold Circuit, Analog to Digital Converters: Quantization and Encoding, Parallel Comparator A/D Converter, Successive Approximation A/D Converter, Counting A/D Converter, Dual Slope A/D Converter, A/D Converter using Voltage to Frequency and Voltage to Time Conversion, Specifications of A/D Converters, Example of A/D Converter ICs. Memory Organization and Operation, Expanding Memory Size, Classification and Characteristics of

Memories, Sequential Memory, Read Only Memory (ROM), Read and Write Memory(RAM), Commonly used Memory Chips.

(12 Hours)

TEXT/REFERENCES:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

COURSE OUTCOMES:

After going through this course, the students shall be able to:

1. Understand working of logic families and logic gates.
2. Design and implement Combinational and Sequential logic circuits.
3. Understand the process of Analog to Digital conversion and Digital to Analog conversion.

NOTE:

1. 1.For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 6-7 short answer type questions, will be compulsory & based on the entire syllabus. Rest of the eight questions are to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit. All questions will carry equal marks.
2. 2.The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

NOTE: For examiner for paper setting:-

In semester examinations, examiner is required to set up question paper covering the entire syllabus in accordance with the examination reforms circulated by the AICTE & approved under item No. 14_18 of academic council.

EE280C **LOGIC AND SEQUENTIAL CIRCUITS LAB**

B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)

Choice Based Credit System (effective from Session 2019-20)

SEMESTER-IV

L	T	P	Credits		
0	0	2	1	Field work	: 25
				Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

LIST OF EXPERIMENTS:

1. To realize and verify truth tables of TTL gates –AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. To realize the universal property of NAND gate.
3. To realize the universal property of NOR gate.
4. Design & realize a given function using K-maps and verify its performance.
5. To verify the operation of Multiplexer & De-multiplexer.
6. To verify the operation of Comparators.
7. To perform Half adder and Full adder.
8. To perform Half Substractor and Full Substractor.
9. To verify the truth table of S-R, J-K, T & D Type flip flop.
10. To verify the operation of bi-directional shift register.
11. To verify the operations of analog to digital and digital to analog converter.
12. To design & verify the operation of 3 bits' synchronous counter.
13. To design & verify the operation of synchronous UP/DOWN decade counter using JK flip flop & derive a seven segment display using the same.
14. To design & verify the operation of asynchronous UP/DOWN decade counter using JK flip flop & derive a seven segment display using the same.
15. Design a 4- bit shift register, verify its operation and verify the operation of a ring counter and a Johnson counter.
16. To implement the experiment 1 on NI ELVIS Board.
17. To implement Boolean expression on NI ELVIS Board.

NOTE:

1. The students will be required to perform the 8 experiments/exercises from the above list and any other experiment designed on the basis course.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/ex-change of calculator are prohibited in the examinations.
3. Electronic gadgets including cellular phones are not allowed in the examination.

EE204C

ELECTRICAL MACHINES – II
B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)
Choice Based Credit System (effective from Session 2019-20)
SEMESTER-IV

L	T	P	Credits		
3	1	0	4	Field work	: 25
				Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

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

1. Understand the concepts of rotating magnetic fields.
2. Understand the operation of ac machines.
3. Analyse performance characteristics of ac machines.

Unit-I

Fundamentals of AC machine windings (8 Hours):
Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single-turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, 3D visualization of the above winding types, Air-gap MMF distribution with fixed current through winding-concentrated and distributed, Sinusoidally distributed winding, winding distribution factor

Pulsating and revolving magnetic fields (4 Hours):
Constant magnetic field, pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding - fixed current and alternating current Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field.

Unit-II

Induction Machines (10 Hours):
Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors.

Unit-III

Induction Generators (3 Hours):
Generator operation. Types-Self-excitation, Doubly-Fed Induction Machines and their applications

Single-phase induction motors (6 Hours):
Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and applications

Unit-IV

Synchronous machines(10 Hours):
Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation.

Characteristics of synchronous machines, V-curves. Salient pole machine - two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division.

Text/References:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
4. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
5. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
6. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.

NOTE:

1.For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 6-7 short answer type questions, will be compulsory & based on the entire syllabus. Rest of the eight questions are to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit. All questions will carry equal marks.

2.The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

NOTE: For examiner for paper setting:-

In semester examinations, examiner is required to set up question paper covering the entire syllabus in accordance with the examination reforms circulated by the AICTE & approved under item No. 14_18 of academic council.

EE282C

ELECTRICAL MACHINES – II LAB
B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)
Choice Based Credit System (effective from Session 2019-20)
SEMESTER-IV

L	T	P	Credits		
0	0	2	1	Field work	: 25
				Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

LIST OF EXPERIMENTS:

1. To perform starting and reversing the direction of rotation of 1-Phase and 3-Phase induction motor.
2. To perform the open circuit test and block rotor test on 3 phase induction motor and determine equivalent circuit parameters.
3. To conduct the load test to determine the performance characteristics of the I.M.
4. To compute the torque v/s speed characteristics of 3-phase induction motor for various stator voltages .
5. To perform speed control of induction motor by using rotor resistance control.
6. To perform speed control of 3-Phase induction motor by using V/f control method.
7. To perform the open circuit test and block rotor test on single-phase induction motor and determine equivalent circuit parameters.
8. To draw Voltage Vs load Characteristics of 3 phase synchronous generator, and draw input vs. Output power.
9. To perform O.C. test on synchronous generator. And determine the full load regulation of a three phase synchronous generator by synchronous impedance method.
10. To plot V- Curve of synchronous motor.
11. To study the parallel operation of synchronous generators.

NOTE:

1. The students will be required to perform at least 8 experiments/ excersices from the above list and any other experiments designed on the basis course.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/ex-change of calculator are prohibited in the examinations.
3. Electronic gadgets including cellular phones are not allowed in the examination.

EE206C **POWER SYSTEM -I**

B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)

Choice Based Credit System (effective from Session 2019-20)

SEMESTER-IV

L	T	P	Credits		
				Field work	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

COURSE OBJECTIVES: This course has been designed to understand the basics of power system problems and analysis and to analyze the system under normal and under fault condition. The students shall be able to represent the power system network for steady state or dynamic analysis.

COURSE OUTCOMES: At the end of this course, students will demonstrate the ability to understand the concepts of power systems, various power system components, evaluate fault currents for different types of faults, generation of over-voltages and insulation coordination, basic protection schemes, concepts of HVDC power transmission and renewable energy generation.

UNIT-I

BASIC CONCEPTS: Evolution of Power Systems and Present-Day Scenario. Structure of a power system: Bulk Power Grids and Micro-grids. Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radial systems). Feeder, Servicemains Substations, Mechanical design of Transmission, Synchronous Grids and Asynchronous (DC) interconnections. Comparison of ac and dc transmission

UNIT-II

POWER SYSTEM ANALYSIS: Overhead Transmission Lines and Cables: Electrical and Magnetic Fields around conductors, Corona. Parameters of lines and cables. Capacitance and Inductance calculations for simple configurations. Short, medium and long lines. Power Transfer, Voltage profile and Reactive Power. Characteristics of transmission lines. Surge Impedance Loading. Generation of Over-voltages: Lightning and Switching Surges. Protection against Over voltages, Insulation Coordination. Propagation of Surges. Voltages produced by traveling surges. Bewley Diagrams

UNIT-III

POWER SYSTEM COMPONENTS: Insulators, Application of Phase-shifts. And Distribution transformers, Tap-Changing transformers. Synchronous Machines: Steady-state performance characteristics. Real and Reactive Power Capability Curve of generators. Typical waveform under balanced terminal short circuit conditions – steady state, transient and sub-transient equivalent circuits. Loads: Types, Voltage and Frequency Dependence of Loads. Per-unit System and per-unit calculations.

UNIT-IV

FAULT ANALYSIS AND PROTECTION SYSTEMS: Method of Symmetrical Components (positive, negative and zero sequences). Balanced and Unbalanced Faults. Representation of generators, lines and transformers in sequence networks. Computation of Fault Currents.

Neutral Grounding. Switchgear: Types of Circuit Breakers. Attributes of Protection schemes, Back-up Protection. Protection schemes (Over-current, directional, distance protection, differential protection), Power line carrier communication and their application.

TEXT BOOKS:

1. J. Grainger and W. D. Stevenson, “Power System Analysis”, McGraw Hill Education, 1994.
2. O. I. Elgerd, “Electric Energy Systems Theory”, McGraw Hill Education, 1995.
3. S K Gupta, “Power System Analysis”, Umesh Publication 2009
4. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, “Electric Power Systems”, Wiley, 2012.

REFERENCE BOOKS:

5. A.R. Bergen and V. Vittal, “Power System Analysis”, Pearson Education Inc., 1999.
6. Advanced Power System Analysis & Dynamics by L P Singh: Wiley Eastern LTD New Delhi
7. Elements of Power System Analysis by W D Stevenson: MGH Publication New Delhi
8. Power Generation, operation and control by Alen J. Wood by Wiley.

NOTE:

1.For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 6-7 short answer type questions, will be compulsory & based on the entire syllabus. Rest of the eight questions are to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit. All questions will carry equal marks.

2.The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

NOTE: For examiner for paper setting:-

In semester examinations, examiner is required to set up question paper covering the entire syllabus in accordance with the examination reforms circulated by the AICTE & approved under item No. 14_18 of academic council.

EE284C

POWER SYSTEM -I LAB
B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)
Choice Based Credit System (effective from Session 2019-20)
SEMESTER-IV

L	T	P	Credits		
0	0	2	1	Field work	: 25
				Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

Experiment No. 1: (i) Study over current relay
(ii) Draw the current-time characteristics of an over current relay for TMS=1 & 0.5 and PSM=1.25 & 1.
Experiment No. 2: (i) Study percentage bias differential relay.
(ii) Plot the characteristics of a percentage bias differential relay for 20%, 30% and 40% biasing
Experiment No. 3: To draw the operating characteristics of IDMT over current relay.
Experiment No. 4: To draw the operating characteristics of IDMT under Voltage relay.
Experiment No. 5: To draw the operating characteristics of IDMT over Voltage relay.
Experiment No. 6: To draw the operating characteristics of Differential current relay.
Experiment No. 7: To draw the operating characteristics of negative sequence relay.
Experiment No. 8: To obtain A B C D parameter of a transmission line (model).
Experiment No. 9: To study Ferranti Effect on transmission line model.
Experiment No. 10: To visit study and draw the layout of 33KV substation.
Experiment No. 11: To visit study and draw the layout of 110/220 KV substation
Experiment No. 12: To study and designing of Earthing / Grounding.
Experiment No. 13: Study the burden effect on the performance of CT and measure ratio error.
Experiment No. 14: Study filtration and Treatment of transformer oil.
Experiment No. 15: Determine dielectric strength of transformer oil.

Note: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set up by the department as per the scope of the syllabus.

EE208C **SIGNAL AND SYSTEMS**

B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)

Choice Based Credit System (effective from Session 2019-20)

SEMESTER-IV

L	T	P	Credits		
3	0	0	3	Field work	: 25
				Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

COURSE OBJECTIVES:

The main goals of this course are:

1. To provide the basic understanding about the signals and their basic properties.
2. To give the ideas about different types of signals and systems.
3. Understanding of the signal analysis tools and conversion from one domain to the other.
4. To give the knowledge of the sampling and reconstruction of the sampled signal.

UNIT - I

Introduction to Signals and Systems: Introduction, Signals and systems, Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

(12 hours)

UNIT - II

Behavior of continuous and discrete-time LTI systems: Impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, Cascade interconnections. Characterization of causality and stability of LTI systems.System representation through differential equations and difference equations.State-space Representation of systems, State-Space Analysis, Multi-input, multi-output representation.State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

(12 hours)

UNIT - III

Fourier, Laplace and z- Transforms: Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

(12 hours)

UNIT - IV

Sampling and Reconstruction: The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects.Relation between continuous and discrete time systems. Introduction to the

applications of signal and system theory: modulation for communication, filtering, feedback control systems.

(12 hours)

TEXT/REFERENCES:

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, “Signals and systems”, Prentice Hall India, 1997.
2. J. G. Proakis and D. G. Manolakis, “Digital Signal Processing: Principles, Algorithms, and Applications”, Pearson, 2006.
3. H. P. Hsu, “Signals and systems”, Schaum’s series, McGraw Hill Education, 2010.
4. S. Haykin and B. V. Veen, “Signals and Systems”, John Wiley and Sons, 2007.
5. A. V. Oppenheim and R. W. Schafer, “Discrete-Time Signal Processing”, Prentice Hall, 2009.
6. M. J. Robert “Fundamentals of Signals and Systems”, McGraw Hill Education, 2007.
7. B. P. Lathi, “Linear Systems and Signals”, Oxford University Press, 2009.

COURSE OUTCOMES:

After going through this course, the students shall be able to:

1. Understand the concepts of continuous time and discrete time systems.
2. Analyse systems in complex frequency domain.
3. Understand sampling theorem and its implications.

NOTE:

1. 1.For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 6-7 short answer type questions, will be compulsory & based on the entire syllabus. Rest of the eight questions are to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit. All questions will carry equal marks.
2. 2.The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

NOTE: For examiner for paper setting:-

In semester examinations, examiner is required to set up question paper covering the entire syllabus in accordance with the examination reforms circulated by the AICTE & approved under item No. 14_18 of academic council.

MATH203C
MATHEMATICS-III
(Probability and Statistics)
B.Tech. Semester-III (Except CSE & Bio Tech.)
(w.e.f. Session 2018-2019)

L	T	P	Credits		
3	1	0	4	Field work	: 25
				Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

Note:

1. The paper setter will set two questions (with/without parts) from each units, & a ninth compulsory question comprising of 6 to 10 sub-parts, covering the entire syllabus. The examinee will attempt 5 questions in all, along with the compulsory question (with all it sub-parts), selecting one question from each unit.
2. The use of programmable devices such as programmable calculators, etc. is not allowed during the exam.

UNIT-I (12 Lectures)

Measures of Central tendency: Moments, skewness and Kurtosis- Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameter for these three distributions, Correlation and regression — Rank correlation.

UNIT-II (12 Lectures)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.
Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

UNIT-III (12 Lectures)

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

UNIT-IV (12 Lectures)

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.
Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

Suggested Text/Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. S.S. Sastry, Engineering Mathematics, PHI, Vol. I & II.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
5. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
6. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
7. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

Course outcomes:

1. The students will be able to apply the concept of central tendencies, moment , skewness and kurtosis in designing the structure and nature of the curve.
2. The students will apply principle of least squares and chi-square test in defining the fitness of goods and shape of curves
3. The students can apply the probability spaces & conditional probability concept and properties in practical problems.
4. The students will be able to use the functioning of continuous random variable, distribution functions and densities in various field works.

NOTE: For examiner for paper setting:-

In semester examinations, examiner is required to set up question paper covering the entire syllabus in accordance with the examination reforms circulated by the AICTE & approved under item No. 14_18 of academic council.

BT221C **BIOLOGY for Engineers**

B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)

Choice Based Credit System (effective from Session 2019-20)

SEMESTER-IV

L	T	P	Credits		
3	0	0	3	Field work	: 25
				Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs

UNIT-I

Introduction: Significance of biology; why study biology ; Biological observation in history that led to the discovery of some major engineering basics(Brownian motion & origin of thermodynamics); Fundamental similarities and difference between science and engineering- human as the best machines, comparison between eye camera, flying of a bird and aircraft etc.

Classification: classification based on (a) cellularity- unicellular or a multicellular (b) Ultrastructure-prokaryotes or eukaryotes (c) Energy and carbon utilization- autotrophs and lithotrophs (d) Ammonia excretion –aminotelic, uricotelic (e) Habit- aquatic or terrestrial ; Molecular Taxonomy three major kingdoms of life.

Single-celled organism-Microorganism and Microbiology: concept of single called organism , species and strains; Identification and classification of microorganism ; Ecological aspects of single celled organism; Microscopy.

UNIT-II

Biomolecules: Molecules of the life –Monomeric unit and polymeric structure –sugar , starch and cellulose , Amino acid and proteins; Nucleotides and DNA/RNA;Two carbon unit and lipids.

Proteins and Enzymes: proteins structure and function ; Hierarchy in protein structure – primary , secondary , tertiary and quaternary structure; proteins as enzymes, transporters , receptors and structural elements; Enzymes classification and mechanism of action ; Enzymes catalysed reaction ; Enzyme kinetic and kinetic parameters;RNA catalysis

UNIT –III

Genetics: Genetics is to biology what Newtons law are to physics; model laws of genetics; concept of allele, recessiveness and dominance, segregation and independent assortment; Genetic material passes from parent to offspring ; Epistasis; Mapping of phenotype yto genes, gene/linkage mapping ; single gene disorder in human ; meiosis and mitosis.

Genes, Chromosomes and information transfer: DNA as genetic material ; Hierarchy of DNA structure single stranded to double stranded to nucleosomes to chromosomes; Moleculear basis of information transfer concept of genetic code ; Universality and degeneracy of genetic code.

UNIT-IV

Metabolism: Similarities between fundamental principles of energy transaction in physical and biological world; Thermodynamics as applied to biological system; Exothermic and endothermic versus endergonic and exergonic reaction; Concept of $K_{eq}$and its relation to standard free energy ; Spontaneity; APT as an energy currency; Glycolysis and Krebs cycle (breakdown of glucose to CO_2 to H_2O); Photosynthesis (synthesis of glucose from CO_2 toH_2O); Energy Yielding and energy consuming reaction; Concept of energy change.

TEXT BOOK:

1. Biology : a Gopal approach Campbell , N.A Reece, J.B Urry ,Lisa; Cain M.L Wasserman , S.A Minorsky,P.VJackson, R.B Person Education ltd
2. Outline of Biochemistry , conn E.E Stumpf, P.K Burening ,G; Doi, R.H;John Wiley and sons

REFERENCE BOOK:

B. Tech. 3rd Year (V & VI semester only) Electrical Engg.: Approved in 15th meeting of Academic Council held on 14.08.2020. applicable to all students admitted in 2018-19 & onwards and trailing students.

1. Principles of Biochemistry(V Edition) by Nelson, D.L; and Cox, M.M.W.H Freeman and company.
2. Molecular Genetics (second Edition) stent G.S; Calender , R.W.H Freeman Company Distributed by satishkumarjain for CBS Publisher.
3. Microbiology , Prescott, L.M.J.P; Harley and CA Klein 1995, 2nd edition W.M.C Brown Publisher.

NOTE:

1.For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 6-7 short answer type questions, will be compulsory & based on the entire syllabus. Rest of the eight questions are to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit. All questions will carry equal marks.

2.The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

NOTE: For examiner for paper setting:-

In semester examinations, examiner is required to set up question paper covering the entire syllabus in accordance with the examination reforms circulated by the AICTE & approved under item No. 14_18 of academic council.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
B.Tech. 3rd YEAR ELECTRICAL ENGINEERING (SEMESTER – V)
Choice Based Credit System Scheme Of Studies & Examinations w.e.f. 2020-21

Sl. No.	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credits	Duration of Exam
			L	T	P		Theory	Practical			
1	EE301C	Power Electronics	3	1	0	25	75	0	100	4	3
2	EE381C	Power Electronics Laboratory	0	0	2	25	0	75	100	1	3
3	EE303C	Control Systems	3	1	0	25	75	0	100	4	3
4	EE383C	Control Systems Laboratory	0	0	2	25	0	75	100	1	3
5	EE305C	Electromagnetic Fields	3	1	0	25	75	0	100	4	3
6	PE1	Program Elective - 1	3	0	0	25	75	0	100	3	3
7	PE2	Program Elective - 2	3	0	0	25	75	0	100	3	3
8	HSMC	Economics for Engineers	3	0	0	25	75	0	100	3	3
Total			**18**	**03**	**04**	**200**	**450**	**150**	**800**	**23**	**24**

L= Lecture, T = Tutorial, P = Practical,& MC = Mandatory Course (Audit)

1. The students will be allowed to use non-programmable scientific calculator in the examination. However, Sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including Cellular phones are not allowed in the examination.

PROGRAM ELECTIVE-1 (PE1)

EE321C	Advanced Network Analysis
EE323C	Electrical Machine Design
EE325C	Industrial Electrical Systems
EE327C	Computer Architecture

PROGRAM ELECTIVE-2 (PE2)

EE331C	Electrical Engineering Materials
EE333C	Power Plant engineering
EE335C	Energy Management
EE337C	Process Control and

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)

B.Tech. 3rd YEAR ELECTRICAL ENGINEERING (SEMESTER – VI)
Choice Based Credit System Scheme Of Studies & Examinations w.e.f. 2020-21

Sl. No.	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credits	Duration of Exam
			L	T	P		Theory	Practical			
1	EE302C	Power Systems – II	3	1	0	25	75	0	100	4	3
2	EE380C	Power Systems Laboratory - II	0	0	2	25	0	75	100	1	3
3	EE304C	Microprocessor& Micro-controller	3	0	0	25	75	0	100	3	3
4	EE382C	Microprocessor & Micro-controller Laboratory	0	0	2	25	0	75	100	1	3
5	EE384C	Electronics Design Laboratory	0	0	4	25	0	75	100	2	3
6	PE3	Program Elective - 3	3	0	0	25	75	0	100	3	3
7	PE4	Program Elective - 4	3	0	0	25	75	0	100	3	3
8	PE5	Program Elective - 5	3	0	0	25	75	0	100	3	3
9	HSMC350C	Applications of Psychology in Engineers Life	3	0	0	25	75	0	100	3	3
Total			**18**	**01**	**08**	**225**	**450**	**225**	**900**	**23**	**27**

L= Lecture, T = Tutorial, P = Practical,& MC = Mandatory Course (Audit)

1. The students will be allowed to use non-programmable scientific calculator in the examination. However, Sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including Cellular phones are not allowed in the examination.
3. At the end of 6th semester, each student has to undergo Summer Internship of at least 4 weeks from the industry / institute /research lab / training centre, etc. during summer vacation & its evaluation shall be carried out in 7th Semester.

PROGRAM ELECTIVE-3 (PE3)

EE322C	Electromagnetic Waves
EE324C	Wind & Solar Energy Systems
EE326C	Electrical Energy Conservation and Auditing
EE328C	Digital Control Systems

PROGRAM ELECTIVE-4 (PE4)

EE332C	Line Commutated and Active Rectifiers
EE334C	HVDC Transmission
EE336C	Utilization of Electric Power and Traction
EE338C	Digital Signal Processing

PROGRAM ELECTIVE -5 (PE5)

EE342 C	Sensors and Transducers
EE344 C	Fuzzy Systems
EE346 C	Analog and Digital Communication
EE348 C	Optimization Techniques

EE301C POWER ELECTRONICS
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- V

L	T	P	Credits	Class-work Marks	: 25
3	1	0	4	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes:

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

Understand the differences between signal level and power level devices.

Analyse controlled rectifier circuits.

Analyse the operation of DC-DC choppers.

Analyse the operation of voltage source inverters.

Unit -I

Power switching devices

Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET and IGBT. Protection of Devices.

Diode rectifiers with passive filtering

Half-wave diode rectifier with RL and RC loads; 1-phase full-wave diode rectifier with L, C and LC filter; 3-phase diode rectifier with L, C and LC filter; continuous and discontinuous conduction, input current waveshape, effect of source inductance; commutation overlap.

Unit -II

Thyristor rectifiers

Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R-load and highly inductive load; Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape and power factor.

Unit -III

DC-DC buck converter

Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage, power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output voltage.

DC-DC boost converter

Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

Single phase and three phase AC controller- operation, performance and applications.

Unit -IV

Single-phase voltage source inverter

Power circuit of single-phase voltage source inverter, switch states and instantaneous output voltage, square wave operation of the inverter, concept of average voltage over a switching cycle, bipolar sinusoidal modulation and unipolar sinusoidal modulation, modulation index and output voltage

Three-phase voltage source inverter

Power circuit of a three-phase voltage source inverter, switch states, instantaneous output voltages, average output voltages over a sub-cycle, three-phase sinusoidal modulation

Text/References:

1. M. H. Rashid, “Power electronics: circuits, devices, and applications”, Pearson Education India, 2009.
2. N. Mohan and T. M. Undeland, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons, 2007.
3. L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.

NOTE:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:
   Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines “AICTE Examination Reforms”. Students shall be informed about these reforms.

EE381C POWER ELECTRONICS LABORATORY
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- V

L	T	P	Credits	Class-work Marks	: 25
0	0	2	1	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes:

At the end of this course students will demonstrate the ability to
Understand the operating characteristics of power electronics devices.
Analyse the performance of controlled rectifier circuits.
Analyse the operation of DC-DC choppers.
Analyse the operation of voltage source inverters.

LIST OF EXPERIMENTS:

1. To plot the characteristics of diode, thyristor, triac, transistor and MOSFET.
2. Firing angle control of R and R-C firing circuits, UJT firing circuits.
3. Develop the complementary voltage commutation using ring counter.
4. To obtain the performance parameters of three phase diode bridge rectifier with filter.
5. To plot the performance parameters of full wave converter.
6. To control the A.C. voltage with phase control technique.
7. To obtain the performance parameters of buck, boost chopper.
8. To conduct the load test on single phase inverter.
9. To obtain the performance parameters of H- bridge inverter.
10. To simulate the three-phase inverter and study its performance.

Reference Book:

Power Electronics Laboratory: Theory, Practice and Organization, Alpha Science International Limited, 2007

Note:-

1 Total ten experiments are to be performed in the semester.
2 At least eight experiments should be performed from the above list. Remaining three experiments should be performed as designed and set by the concerned institution as per the scope of the syllabus.

EE 303C CONTROL SYSTEMS
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- V

L	T	P	Credits	Class-work Marks	: 25
3	1	0	4	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES:

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

1. Characterize a Control system and find its steady state behaviour.
2. Investigate stability of an analog control system using different tests.
3. Design various controllers.
4. Solve various control problems.

UNIT- I

INTRODUCTORY CONCEPTS:

A) INTRODUCTION TO CONTROL PROBLEM: Industrial Control examples. System / Plant model, types of models, illustrative examples of plants & their inputs and outputs, controller, servomechanism, regulating system, linear time invariant (LTI) system, time-varying system, causal system, open loop & closed loop control system & their illustrative examples, continuous time and sampled data control systems. Effects of feedback on sensitivity (to parameter variations), stability, external disturbance (noise), overall gain, etc. Introductory remarks about non-linear control systems.

B) MATHEMATICAL MODELLING: Concept of transfer function, relationship between transfer function and impulse response, order of a system, block diagram algebra, signal flow graphs: Mason's gain formula & its application, characteristic equation, derivation of transfer functions of electrical and electromechanical systems. Transfer functions of cascaded and non-loading cascaded elements.

UNIT- II

STATE VARIABLE ANALYSIS: Concepts of state, state variable, state model, state models for linear continuous time functions, diagonalization of transfer function, state transition matrix, solution of state equations, concept of controllability & observability.

TIME DOMAIN ANALYSIS: Typical test signals, time response of first order systems to various standard inputs, time response of 2nd order system to step input, relationship between location of roots of characteristics equation and stability, time domain specifications of a general and an under- damped 2^{nd} order system, steady state error and error constants, dominant closed loop poles, concept of stability, pole-zero configuration and stability, necessary and sufficient conditions for stability, Hurwitz stability criterion, Routh stability criterion and relative stability.

UNIT- III

ROOT LOCUS TECHNIQUE: Root locus concept, development of root loci for various systems, stability considerations.

FREQUENCY DOMAIN ANALYSIS: Relationship between frequency response and time-response for 2nd order system, polar, Nyquist, Bode plots, stability, Gain-margin and Phase Margin, relative stability, frequency response specifications.

UNIT- IV

COMPENSATION: Necessity of compensation, compensation networks, application of lag and lead compensation, basic modes of feedback control, proportional (P), integral (I), derivative(D), PI and PID controllers, Tuning of analog PID controllers through Ziegler-Nichols tuning methods (Process reaction curve and Ultimate Gain & Period methods)

CONTROL COMPONENTS & THEIR MODELS: Synchros, dc and ac servomotors, stepper motors, magnetic amplifier, potentiometers, LVDT and techo generators.

TEXT BOOK:

Control System Engineering by I.J. Nagrath & M. Gopal, New Age Publishers.

REFERENCE BOOKS:

1. Automatic Control Systems by B.C. Kuo, PHI Publishers.
2. Modern Control Engg by K. Ogata, PHI Publishers.
3. Control Systems - Principles & Design by Madan Gopal, Tata Mc Graw Hill. Publishers.
4. Modern Control Engineering by R.C. Dorf & Bishop, Addison-Wesley Publishers.
5. Control Systems by R.C.Sukhla, Dhanpat Rai Publishers.
6 Control Systems by Ashfaq Hussain & Haroon Ashfaq, Dhanpat Rai Publishers.

NOTE:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:
   Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines “AICTE Examination Reforms”. Students shall be informed about these reforms.

EE383C CONTROL SYSTEMS LABORATORY
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- V

L	T	P	Credits	Class-work Marks	: 25
0	0	2	1	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES:

At the end of this Laboratory course, the students will be able to have hands on experience of:

10. Using & verifying characteristics of various Control System components.
11. Analyzing the performance of servo motors driven control systems ;
12. Using Lead, lag, lead-lag compensators.
13. designing PID controllers for given Control System.
14. using MATLAB for control system design.

LIST OF EXPERIMENTS

1. To study A.C. servo motor and to plot its torque-speed characteristics.
2. To study D.C. servo motor and to plot its torque speed characteristics.
3. To study the magnetic amplifier and to plot its load current v/s control current characteristics for: (a) series connected mode (b) parallel connected mode.
4. To plot the load current v/ s control current characteristics for self exited mode of the magnetic amplifier.
5. To study the synchro & to: (a) Use the synchro pair (synchro transmitter & control transformer) as an error detector. (b) Plot stator voltage v/ s rotor angle for synchro transmitter i.e. to use the synchro transmitter as position transducer.
6. To use the synchro pair (synchro transmitter & synchro motor) as a torque transmitter.
7. (a) To demonstrate simple motor-driven closed-loop position control system. (b) To study and demonstrate simple closed-loop speed control system.
8. To study the lead, lag, lead-lag compensators and to draw their magnitude and phase plots.
9. To study a stepper motor & to execute microprocessor or computer-based control of the same by changing number of steps, direction of rotation & speed.
10. To implement a PID controller for level control of a pilot plant.
11. To implement a PID controller for temperature control of a pilot plant.
12. To study the MATLAB package for simulation of control system design.

NOTE:

The students are required to perform 10 experiments, with at least 8 experiments from the above list and further two experiments either from the above list or from any other experiments designed on the basis of the corresponding theory course.

EE 305C ELECTROMAGNETIC FIELDS
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- V

L	T	P	Credits	Class-work Marks	: 25
3	1	0	4	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes:

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

5. To understand the basic laws of electromagnetism.
6. To obtain the electric and magnetic fields for simple configurations under static conditions.
7. To analyse time varying electric and magnetic fields.
8. To understand Maxwell's equation in different forms and different media.
9. To understand the propagation of EM waves.

UNIT-I

Review of Vector Calculus (5 hours)

Vector algebra-addition, subtraction, components of vectors, scalar and vector multiplications, triple products, three orthogonal coordinate systems (rectangular, cylindrical and spherical). Vector calculus differentiation, partial differentiation, integration, vector operator del, gradient, divergence and curl; integral theorems of vectors, Conversion of a vector from one coordinate system to another.

Static Electric Field (5 Hours)

Coulomb's law, Electric field intensity, Electrical field due to point charges, Line, Surface and Volume charge distributions, Gauss law and its applications, Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations, Electric dipole, Electrostatic Energy and Energy density.

UNIT-II

Conductors, Dielectrics and Capacitance (6 Hours)

Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of a two wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations.

Static Magnetic Fields (5 Hours)

Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors.

UNIT-III

Magnetic Forces, Materials and Inductance (5 Hours)

Force on a moving charge, Force on a differential current element, Force between differential current elements, Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances.

Time Varying Fields and Maxwell's Equations (6 Hours)

Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces, Boundary Conditions.

UNIT-IV

Electromagnetic Waves (10 Hours)

Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Skin effect, Poynting theorem.

Text / References:

1. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.
2. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.
3. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.
4. G. W. Carter, "The electromagnetic field in its engineering aspects", Longmans, 1954.
5. W. J. Duffin, "Electricity and Magnetism", McGraw Hill Publication, 1980.
6. W. J. Duffin, "Advanced Electricity and Magnetism", McGraw Hill, 1968.

NOTE:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:
   Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

EE 321C ADVANCED NETWORK ANALYSIS
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- V

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes:

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

1. Apply network topology and duality for the analysis of electrical circuits.
2. To evaluate Network function of given Electrical circuits.
3. To understand the synthesis of various network functions.
4. To analyze and Design the circuit models using Laplace transform.

UNIT-I

Network Functions (10 Hours)

Network functions for single port and two port, calculation of network functions for ladder and general networks, poles and zeros, restriction of poles and zeros for driving point and transfer functions, time domain behaviour from pole zero plot, transfer functions in terms of y and z functions, scaling network functions. Positive real functions and other properties, Hurwitz polynomials, computation of residues, even and odd functions, test for positive real functions.

UNIT-II

Network Synthesis (11Hours)

Elementary synthesis operation, LC network synthesis, properties of RC network functions, foster and cauer forms of RC and RL networks. RLC networks: minimum positive real function, brune's method of RLC synthesis, realization difficulties.

UNIT-III

Network Topology (9 Hours)

Network terminology – Graph of a network – Incidence and reduced incidence matrices – Trees –Cutsets – Fundamental cutsets – Cutset matrix – Tie sets – Link currents and Tie set schedules -Twig voltages and Cutset schedules, Duality and dual networks.

UNIT-IV

Application of Laplace Transform to Circuit Analysis (12 Hours)

Laplace Circuit Solutions, Circuit Element Models, Analysis Techniques, Transfer Function, Application Example, Design Examples, Variable-Frequency Network Performance, Resonant Circuits Filter Networks (Passive and Active).

Text / References:

1. Modern Network Synthesis, M. E. Van Valkenburg, Wiley Eastern.
2. Kuo, F.F., " Network Analysis and Synthesis", 2nd Ed., Wiley India. 2008.
3. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education,2013.
4. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.
5. DeCarlo, R.A. and Lin, P.M., "Linear Circuit Analysis: Time Domain, Phasor and Laplace Transform Approaches", Oxford University Press. 2003.
6. M.E. Van Valkenburg, "Network Analysis", 3rd ed., Pearson 2006.

NOTE:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:
   Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

EE 323C ELECTRICAL MACHINE DESIGN
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- V

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES:

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

1. Understand the construction and performance characteristics of electrical machines.
2. Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines
3. Understand the principles of electrical machine design and carry out a basic design of an ac machine.
4. Use software tools to do design calculations.

UNIT-I

Introduction of electrical machine design: (12Hours) Introduction Major Considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.

Transformers: Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

UNIT-II

Induction Motors : **(10Hours)** Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of poly-phase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

UNIT-III

Synchronous Machines: (12Hours) Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

UNIT-IV

Computer aided Design (CAD): (12Hours)

Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to complex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.

Text Books:

1. A. K. Sawhney, “A Course in Electrical Machine Design”, Dhanpat Rai and Sons, 1970.
2. M.G. Say, “Theory & Performance & Design of A.C. Machines”, ELBS London.
3. S. K. Sen, “Principles of Electrical Machine Design with computer programmes”, Oxford.

Reference Books:

1. K. L. Narang, “A Text Book of Electrical Engineering Drawings”, SatyaPrakashan, 1969.
2. A. Shanmugasundaram, G. Gangadharan and R. Palani, “Electrical Machine Design Data Book”, New Age International, 1979.
3. K. M. V. Murthy, “Computer Aided Design of Electrical Machines”, B.S. Publications, 2008.
4. Electrical machines and equipment design exercise examples using Ansoft’s Maxwell 2D machine design package.

NOTE:

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3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:
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EE 325C INDUSTRIAL ELECTRICAL SYSTEMS
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- V

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes:

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

1. Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.
2. Understand various components of industrial electrical systems.
3. Analyze and select the proper size of various electrical system components.
4. Understand the illumination systems and schemes for residential and commercial consumers.

UNIT-I

Electrical System Components (10 Hours)

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices

UNIT-II

Residential and Commercial Electrical Systems (11 Hours)

Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

UNIT-III

Industrial Electrical Systems (12 Hours)

HT connection, Industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Power factor correction – KVAR calculations, type of compensation, Introduction to PCC, MCC panels, Specifications of LT Breakers, MCB and other LT panel components, UPS System, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

UNIT-IV

Illumination Systems (9 Hours)

Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

Text / References:

1. S. L. Uppal and G. C. Garg, “Electrical Wiring, Estimating & Costing”, Khanna publishers, 2008.
2. K. B. Raina, “Electrical Design, Estimating & Costing”, New age International, 2007.
3. S. Singh and R. D. Singh, “Electrical estimating and costing”, Dhanpat Rai and Co., 1997.
4. Web site for IS Standards.
5. H. Joshi, “Residential Commercial and Industrial Systems”, McGraw Hill Education, 2008.

NOTE:

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EE 327C COMPUTER ARCHITECTURE
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- V

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES:

After going through this course, students will be able to:

1. Understand hierarchy of memory units and their application.
2. Know about the process of pipelined execution and instruction scheduling.
3. Interface different types of I/O and memory units with the main system.
4. Program different microprocessors using their particular instruction sets.
5. Identify functional units, bus structure and addressing modes of different processors.

UNIT - I

Basic Concepts and Computer Evolution: Organization and Architecture, Structure and Function, A brief history of Compters, Evolution of Intel x86 Architecture, Embedded Systems, ARM Architecture, Cloud Computing, Designing for performance, Ahmdahl's Law, Little's Law, Basic Measures of Computer Performance, Calculating the Mean, Benchmarks and Spec.

Computer Arithmetic: The Arithmetic and Logic Unit, Integer Representation, Integer Arithmetic, Floating-point Representation, Floating-point Arithmetic; Control Unit Operation: Micro-operations, control of the processor, hardwired implementation, Microprogrammed Control, Microinstruction Sequencing and Execution.

UNIT – II

Memory Organization: Cache Memory:computer memory system overview, cache memory principles, elements of cache design, Pentium 4 cache organization, Internal Memory: Semiconductor main memory, error correction, DDR DRAM, flash memory, newer non-volatile solid-state memory technologies, External Memory: magnetic disk, RAID 204, solid state drives, optical memory, magnetic tape.

Input-output Organization: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, Direct Cache Access, I/O Channels and Processors, External Interconnection Standards.

UNIT – III

Central Processing Unit: Machine Instruction Characteristics, Types of Operands, Intel x86 and ARM Data Types, Types of Operations, Intel x86 and ARM Operation Types, Addressing Modes, x86 and ARM Addressing Modes, Instruction Formats, x86 and ARM Instruction Formats, Assembly Language, Processor Organization, Register Organization, Instruction Cycle, Instruction Pipelining, The x86 processor family, ARM Processor, Reduced Instruction Set Architecture, RISC Pipelining 555, RISC vs CISC.

UNIT – IV

Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets, Datapath and Control Considerations, Superscalar Operations, Performance Considerations: Effect of Instruction Hazards, Number of Pipeline Stages.
Alternate Machine Architectures: Register Machine, Register Implicit Machine, Accumulator Machine, Stack Machine.

TEXT BOOKS:

1. W. Stallings, *Computer organization and Architecture: Designing for Performance*, 10thEd., PHI, 2016.
2. C.Hamacher, *Computer Organization*, 5thEd., McGraw Hill Publishers, 2002.

REFERENCE BOOKS:

1. V. Carl, G. Zvonko and S. G. Zaky, *Computer Organization*, McGraw Hill, 1978.
2. J. L. Hennessy and D. A. Patterson, *Computer Architecture: A Quantitative Approach*, Morgan Kauffman, 2011.
3. B. Brey and C. R. Sarma, *The Intel microprocessors*, Pearson Education, 2000.
4. P. Barry and P. Crowley, *Modern Embedded Computing*, Morgan Kaufmann, 2012.
5. N. Mathivanan, *Microprocessors, PC Hardware and Interfacing*, Prentice Hall, 2004.
6. Y. C. Lieu and G. A. Gibson, *Microcomputer Systems: The 8086/8088 Family*, Prentice Hall, 1986.
7. J. Uffenbeck, *The 8086/8088 Design, Programming, Interfacing*, Prentice Hall, 1987.
8. B. Govindarajalu, *IBM PC and Clones*, Tata McGraw Hill, 1991.

NOTE:

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EE331C ELECTRICAL ENGINEERING MATERIALS
B.TECH. (ELECTRICAL ENGINEERING)
SEMESTER- V

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

COURSE OUTCOMES:

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

CO1. make students familiar with different types of Electrical Engineering materials

CO2 understand the properties of electrical conducting, semi-conducting, insulating, magnetic and special purpose materials.

CO3. Select suitable materials for diff. applications of Electrical Engineering.

CO4. Use materials for energy saving but with environmental concerns.

UNIT- I CONDUCTORS:

Free electron theory of metals, factors affecting electric conductivity of metals, thermal conductivity of metals, heat developed in current Carrying conductors, thermoelectric effect, super conductivity.properties of electrical conductivity.

CONDUCTING MATERIALS:High conductive materials-copper, Aluminium, Tungsten, Nickel, Brass, Bronze and other alloys; contact materials-Murcurry, other alloys; High resistivity materials-carbon, graphite, Nichrome; Fuses.

UNIT-II

DIELECTRICS: Dielectric properties of insulators in static fields. The static dielecric constant. Polarization and dielectric constant. Dielectric constant of monatomic gases and polyatomic molecules. Internal fields in solids and liquids. Ferroelectric materials, spontaneous polarization, piezoelectricity.

INSULATING MATERIALS: Gaseous Materials-Oxide gases, electronegative gases, hydrocarbon gases; Liquid materials-mineral oils, silicon liquids, hydrocarbon liquids; Solid Materials-Paper and boards, Resins (Polymers), Rubbers-natural and synthetic, glass, ceramics, asbestos.

UNIT- III

MAGNETIC PROPERTIES OF MATERIALS: Magnetic dipole moment of current loop. Magnetisation from a macroscopic viewpoint. Orbital magnetic dipole moment and angular momentum of two simple atomic models. Lenz's law and induced dipole moments. Classification of magnetic materials. Diamagnetism. Origin of permanent magnetic dipole moments. Paramagnetism, ferromagnetic domains, magnetic anisotro. Magnetostriction, antiferromagnetism, ferromagnetism, magnetic materials for electrical devices.

UNIT-IV

SEMICONDUCTORS & THEIR PROPERTIES: Introductions to semiconductor materials, classifications of element semiconductors, Growth of semiconductor materials methods, conductivity of semiconductor. **PROPERTIES**: Electron-hole concentration, Fermi level, Generation and recombination, carrier life-time, diffusion length. Scattering and mobility of carriers. Einstein relation. LASER.

TEXT BOOKS:

1. Electrical Engineering Materials: A.J. Dekker; PHI.
2. Solid State Electronic Devices: StreetMan& Banerjee; Pearson.

REFERENCE BOOKS:

1. Electrical Engineering Materials: S.P Seth & P.V Gupta; Dhanpat Rai.
2. Electrical Engineering Materials by R K Shukla, Archana Singh, Mc Graw Hill.
3. Electrical Engineering Materials & semiconductor devices by JB Gupta, KATSON pub.

NOTE:

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333C POWER PLANT ENGINEERING
B.TECH. (ELECTRICAL ENGINEERING)
SEMESTER- V

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES:
At the end of this course, the students will be able to:
1 To provide an overview of power plants and the associated energy conversion issues.
2To introduce students to different aspects of power plant engineering.
3To familiarize the students to the working of power plants based on different fuels.
4To expose the students to the principles of environmental issues.

UNIT- I

Introduction: Conventional & Non-Conventional Sources of Energy and their availability in India, Different Types of Power Plants, Choice of Type of Power Generation, Power Plants in India.

Hydro Power Plants: Hydrology – Hydrographs, Flow Duration Curve, Mass Curve; Principle of working, Classification, Site selection; Different components & their functions; Types of Dams; Types, Characteristics & Selection of Hydro-Turbines; Specific Speed of Hydro-Turbines; Power Output Equation; General arrangement and Operation of Hydroelectric Power Plant, Mini & Micro Hydro Power Plants, Pumped Storage Power Plants; Advantages of Hydroelectric Power Plants; Hydro Power in India & future trends.

UNIT- II

Nuclear Power Plants: Principle of Nuclear Energy, Nuclear Power Plant Components & their Functions; Nuclear Fuels, Radioactivity, Nuclear Reaction & Classification; Nuclear Reactors – Types & Classification, Main Parts; Problems in Reactor Operation; Radiation Hazards; Safety Measures; Nuclear Waste & its Disposal; Nuclear Power in India.

UNIT- III

Gas Power Plants: Operating Principle; Classification – Open Cycle, Closed Cycle, Combined Cycle; Fuels for Gas Turbine Power Plants; Different Components and their functions; Gas Turbine Characteristics, Cycle Efficiency, Operational Aspects, Advantages and Limitations.

Diesel Power Plants: Working principle, Types of Diesel Engines, Different parts / systems and their functions, Performance of Diesel Engine, Plant Operation and Efficiency, Advantages and Disadvantages.

UNIT- IV

Thermal Power Plants: Operating Principle, Site selection, Coal to Electricity, General Layout of Thermal Power Plant, Brief description of different parts/systems and their functions, Advantages and Limitations.

Co-Generation: Concept; Schemes; Brief Description;

Non-Conventional Energy Sources: Types, Brief Description, Advantages & Limitations.

TEXT BOOKS:

1.Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
2. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010.
3. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw . Hill,1998

REFERENCE BOOKS:

1. A Course in Electric Power System, Soni, Gupta, Bhatnagar, DhanpatRai& Sons
2. Power System Engineering, Nagrath& Kothari, Tata Mc-Graw Hill, New Delhi
3. Power Plant Engg: G.D. Rai
4. Electric Power: S.L. Uppal (Khanna Publishing)

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EE335C ENERGY MANAGEMENT
B.TECH. (ELECTRICAL ENGINEERING)
SEMESTER-V

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes:

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

1. Understand the importance of energy monitoring and targeting.
2. Understand the concepts of financial management techniques and need for investment appraisal and criteria.
3. Understand the principles of project planning relevant to energy management.
4. Understand the key elements for successful energy management.

UNIT-I

Energy Action Planning (10 Hours)

Energy Policy, key elements, formulation, ratification, organizing –location of energy management, top energy management commitment and support, roles and responsibilities of energy manager, requirement for energy action planning, evaluating energy performance, management tools for effective energy implementation.

UNIT-II

Financial Management (10 Hours)

Introduction, need for investment, appraisal and criteria, financial analysis techniques for energy management-simple payback period, return on investment, net present value, internal rate of return, cash flow, sensitivity and risk analysis, financing options, energy performance contracting and role of ESCOs developing a typical ESCO contract, A case study for energy efficiency in buildings through ESCO.

UNIT-III

Project Management (10 Hours)

Definition and scope of project, project development cycle-technical design, financing, contracting, implementation and performance monitoring, project planning techniques, implementation plan for energy management, planning budget, procurement procedures, construction, measurement and verification.

UNIT-IV

Energy Monitoring and Targeting (10 Hours)

Definition of energy monitoring and targeting, setting up monitoring and targeting, key elements of energy monitoring and targeting system, data and information analysis, techniques related to energy consumption and production, energy management information system (EMIS).

Text/Reference Books

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online)
2. S. C. Tripathy, “Utilization of Electrical Energy and Conservation”, McGraw Hill, 1991.
3. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

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EE 337C PROCESS CONTROL AND INSTRUMENTATION
B.TECH. (ELECTRICAL ENGINEERING)
SEMESTER- V

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES

After going through this course, students will be able to:

1. Apply various measurement techniques in process control applications.
2. Know about characteristics of different sensors and transducers.
3. Model the behaviour of different physical processes.
4. Check the stability of systems and design the controllers accordingly.
5. Judge the best possible sensors for particular process control applications.

UNIT - I

Introduction to Sensor-based Measurement Systems: General concepts and terminology, Sensor classification, General input-output configuration, Static characteristics of measurement systems: accuracy, precision, sensitivity, linearity, resolution, systematic errors and random errors, Dynamic characteristics: zero-order, first-order and second-order measurement systems, Other sensor characteristics: input characteristics and reliability.

UNIT – II

Measurement of Parameters in Process Industries: Process control, Elements in control loop, Process facility considerations, Pressure measurement: basic concept, measuring instruments and application considerations, Level measurement: basic concept, level sensing devices and application considerations, Flow measurement: basic concept, flow measurement instruments and application considerations, Temperature and Heat measurement: basic concept, temperature measuring devices and application considerations, Measurement of humidity, density, viscosity and pH, Measurement of position, motion and force.

UNIT – III

Process Control Modelling: Introduction, Process model, Physical model, Control model, process modelling: uses and types of process models, Differential equations, Difference equations, Laplace transform, Transfer function representations, Frequency-domain modelling, Time-domain modelling: state variables representation, state differential equation, state variables and state equations for a chemical process, z-transform, inverse z-transform, Modelling procedure.

Linear Open-Loop Systems: Response of First-order systems, Physical examples of first order systems, Response of first-order systems in series, Second-order systems, Transportation Lag.

UNIT – IV

Response Analysis of Control System and Stability: Introduction, Stability analysis: General conditions for stability, Stability criterion, Routh-Hurwitz stability criterion, Performance specifications, Root-locus method, stability in the z-plane, Frequency response of first order system, Nyquist plots, Bode diagram. **Process Control:**

Introduction, Basic terms, Control modes: ON/OFF action, Differential action, Proportional action, Derivative action, Integral action, PID action, Implementation of control loops: ON/OFF action pneumatic controller, ON/OFF action electrical controller, PID action pneumatic controller, PID action control circuits, PID electronic controller, Digital controllers.

TEXT BOOKS:

1. R. Pallas-Areny and J. G. Webster, *Sensors and Signal Conditioning*, 2nd Ed., John Wiley & Sons, 2001.
2. J.S. Saini, "Textbook of Measurements and Instrumentation (With Experiments)", New Age International Publishers.
3. W. C. Dunn, *Fundamentals of Industrial Instrumentation and Process Control*, 2nd Ed., Tata McGraw Hill Education, 2018.
4. D. R. Coughanowr, *Process Systems Analysis and Control*, Tata McGraw Hill, 1991.
5. S. K Singh, *Process Control: Concepts, Dynamics and Application*, PHI Learning Pvt. Ltd., 2009.

REFERENCE BOOKS:

1. D. P. Eckman, *Industrial Instrumentation*, Wiley eastern, 1950.
2. D. Patranabis, *Principles of Industrial Instrumentation*, 2nd Ed., Tata McGraw Hill, 2007.
3. G. Stephanoupoulis, *Chemical Process Control: An Introduction to Theory and Practice,* Prentice Hall, 1984.
4. A. S. Morris, *Measurement and Instrumentation Principles*, Butterworth-Heinemann, 2001.

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3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:
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EE 302C POWER SYSTEM -II
B.TECH. (ELECTRICAL ENGINEERING)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	1	0	4	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES: At the end of this course, students will demonstrate the ability to use numerical methods to analyse a power system in steady state. Understand methods to control the voltage, frequency and power flow. Understand the monitoring and control of a power system. Understand the basics of power system economics.

UNIT-I

POWER FLOW ANALYSIS: Analysis of Power Flows: Formation of Bus Admittance Matrix. Real and reactive power balance equations at a node. Load and Generator Specifications. Application of numerical methods for solution of nonlinear algebraic equations – Gauss Seidel and Newton-Raphson methods for the solution of the power flow equations. Computational Issues in Large-scale Power Systems.

UNIT-II

LOAD FREQUENCY CONTROL: Control of Frequency and Voltage: Turbines and Speed-Governors, Frequency dependence of loads, Droop Control and Power Sharing. Automatic Generation Control.

UNIT-III

MONITORING POWER SYSTEM AND EXCITATION CONTROL: Overview of Energy Control Centre Functions: SCADA systems and its components, protocol. Phasor Measurement Units. and Wide-Area Measurement Systems. Normal, Alert, Emergency, Extremis states of a Power System.

Excitation System Control in synchronous generators, Automatic Voltage Regulators. Shunt Compensators, Static VAR compensators and STATCOMs. Tap Changing Transformers. Three phase Induction regulators, Voltage Stability, Voltage Collapse.

UNIT-IV

BASIC PRICING PRINCIPLES: Generator Cost Curves, Vertically Integrated Utility and restructured Power System, Role of Different entities in restructured market. Market clearing price, Single sided and double sided linear bid market. Transmission and Distributions charges.

TEXT BOOKS

1. J. Grainger and W. D. Stevenson, “Power System Analysis”, McGraw Hill Edition, 1994.
2. O. I. Elgerd, “Electric Energy Systems Theory”, McGraw Hill Edition, 1995.
3. S K Gupta, “Power System Operation Control and Restructuring Analysis”, IK International Publication 2015.
4. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, “Electric Power Systems”, Wiley, 2012.
5. Hadi Saadat, “Power System Analysis”, McGraw Hill Edition 2002.

REFERENCE BOOKS:

6. A.R. Bergen and V. Vittal, “Power System Analysis”, Pearson Education Inc., 1999.
7. Advanced Power System Analysis & Dynamics by L P Singh: Wiley Eastern LTD New Delhi
8. Elements of Power System Analysis by W D Stevenson: MGH Publication New Delhi

9. Power Generation, operation and control by Alen J. Wood by Wiley.

NOTE:

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:
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EE380C POWER SYSTEM LABORATORY II
B.TECH. (ELECTRICAL ENGINEERING)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
0	0	2	1	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

LIST OF EXPERIMENTS:

1. (a) To study some of the commands used in MATLAB.
   (b) Compute the voltages of the given network using MATLAB.
2. Draw the flow chart for forming Y-BUS. Write the computer program in MATLAB. Take any solved numerical question from book and from the Y-BUS. Solve it for the voltage and currents injected in the buses. Match the result.
3. Draw the flow chart for power system analysis of Gauss Siedel Method. Write program in MATLAB for performing load flow analysis using Gauss-Siedel method and solve the given problem, solve the problem by hand for one iteration.
4. Write a MATLAB program for the Newton Raphson Method to find the intersection of the curves.
5. Calculating market clearing price for single sided bidding & obtain share of participating Gencos (Generating Companies).
6. Obtain power solution of the given problem using Fast Decoupled Newton Raphson method then write program for FDNR method using MATLAB and solve this numerical problem.
7. To obtain dynamic response of single area load frequency control using Integral Controller.
8. To develop the Boost Buck Exciter System steady state model & steady state model of IEEE Type-1 Excitation system with compensator Block & PID controller and compare their responses.
9. Stability analysis using equal area criteria & solve the given problem & verify the results of practical & theory.
10. Study basic instructions of PSAT software
11. Study basic instructions of POWERWORLD software
12. Study basic instructions of PSCAD software.

Note: Ten experiments are to be performed, out of which at least eight experiments should be performed from above list. Remaining three experiments may either be performed from above list or designed & set up by the department as per the scope of the syllabus.

EE 304C MICROPROCESSOR & MICROCONTROLLER
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES: Upon successful completion of the course, the students will be able

- To be acquainted with the basic architecture of 8086 microprocessor and 8051 microcontroller
- To develop assembly language programming for variety of problems
- To interface the peripherals like I/O, A/D, D/A, timer etc. with the microprocessors and microcontrollers
- To develop and design various systems using different microcontrollers.
- To develop an in-depth understanding of the operation of microprocessor and microcontrollers, machine language programming and interfacing techniques

UNIT-I

Introduction to 8086 microprocessor, RISC and SISC processors, architecture and pin diagram of 8086 and description of various signals. Register organization of 8086; Description of address computations & memory segmentation; Segment override, Instruction pipelining, Timing diagrams, Addressing modes. **(10Hours)**

UNIT-II

Instruction set of 8086, Instruction execution timing, Instruction format, Data transfer instructions,Arithmetic instructions,Branch instructions, Loop instructions, NOP & HLT instructions, Flag manipulation instructions, Logical instructions, Shift & Rotate instructions, Directives & operators, Interrupts of 8086,Assembly language Programs using 8086. **(10Hours)**

UNIT-III

The concept of microcontroller, comparison between Microcontrollers & Microprocessors.Architecture and Pin diagram of 8051 microcontroller, Memory organization. Special function registers. External memory, Reset operation. Instruction Set, Addressing modes, arithmetic, Logical.Data transfer. Boolean variable manipulation, program branching instructions etc. Programs based on various instructions. Timer operation, Timer Mode register, Timer Control register. Timer modes & overflow flag, Starting, Stopping & controlling the timers. Programs for generating square waves of various frequencies **(11 Hours)**

UNIT-IV

Serial port operation, UART, Serial port control register, Modes of serial port operation. Serial port baud rate, Initialization & programming of serial port. Interrupts of 8051, SFRs related to interrupts, processing interrupts, program design using interrupts. Interfacing with LED, DC motors, stepper motors. **(11Hours)**

Text Books:

1. M. A.Mazidi, J. G. Mazidi and R. D. McKinlay, “The8051Microcontroller and Embedded Systems: Using Assembly and C”,Pearson Education, 2007.
2. Badri Ram, “ Advanced Microprocessors and Interfacing,” Tata McGraw Hill.

Reference Books:

1. K. J. Ayala, “8051 Microcontroller”, Delmar Cengage Learning,2004.
2. D. V. Hall, “Microprocessors & Interfacing”, McGraw Hill Higher Education, 1991.
3. Advanced Microprocessors and Peripherals : A.K.Ray, K.M.Bhurchandi, Mc Graw Hill

NOTE:

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EE382C MICROPROCESSOR & MICROCONTROLLER LABORATORY
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
0	0	2	1	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course outcomes: On completion of this lab course the students will be able to: a. Understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller. b. Work with standard microprocessor real time interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters; c. Troubleshoot interactions between software and hardware; d. Analyze abstract problems and apply a combination of hardware and software to address the problem; e. Use standard test and measurement equipment to evaluate digital interfaces

LIST OF EXPERIMENTS:

(A) 8086 Microprocessor:

1. Write a well-documented program for copying 12 bytes from source to destination, on 8086
microprocessor kit.
2. Write a program for 8086 for division of a defined double word (stored in a data segment) by
another double word and verify.
3. Write a well-documented program for finding the square root of a given number, on 8086,
microprocessor kit.
4. Write a program using 8086 for finding the square of a given number and verify.
5. Write a program using 8086 and verify for:
(i) Finding the largest number from an array.
(ii) Finding the smallest number from an array.
6. (i)Write a program using 8086 for arranging an array of numbers in descending order and
verify.
(ii)Write a program using 8086 for arranging an array of numbers in ascending order and
verify.
7. Write a program for 8086 for finding square of a number using look-up table and verify.
8. Write a program to control the operation of stepper motor using 8086 microprocessor and
8255 chip.
9. Write a program using 8086 to add a series of 16-bit numbers.

(B) 8051 Microcontroller:

10. To study the architecture of 8051 microcontroller.
11. Write a program in 8051 to add and subtract two 8 bit numbers.
12. Write an ALP to generate square wave of 10 kHz frequency using timer of 8051 microcontroller.

13. To find average of Ten 8-bit numbers.
14. Write an ALP to interface LED and switches with 8051 microcontroller.
15. Write a program to find (i) largest number and (ii) smallest number from an array using 8051
microcontroller.
16. Write a program to generate square wave of 50 Hz frequency using timer of 8051 microcontroller.
17. To control the operation of DC motor using 8051 microcontroller.
18. To interface LCD with 8051 microcontroller.
19. To control the operation of stepper motor using 8051 microcontroller

Note:-

1 Total ten experiments are to be performed in the semester.

2 At least eight experiments should be performed from the above list. Remaining three experiments should be performed as designed and set by the concerned institution as per the scope of the syllabus.

EE384C ELECTRONICS DESIGN LABORATORY
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
0	0	4	2	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes: At the end of the course, students will demonstrate the ability to
1. Understand the practical issues related to practical implementation of applications using electronic circuits.
2. Choose appropriate components, software and hardware platforms.
3. Design a Printed Circuit Board, get it made and populate/solder it with components.
4. Work as a team with other students to implement an application.

Basic concepts on measurements; Noise in electronic systems; Sensors and signal conditioning circuits; Introduction to electronic instrumentation and PC based data acquisition; Electronic system design, Analog system design, Interfacing of analog and digital systems, Embedded systems, Electronic system design employing microcontrollers, CPLDs, and FPGAs, PCB design and layout; System assembly considerations. Group projects involving electronic hardware (Analog, Digital, mixed signal) leading to implementation of an application.

Text/Reference Books
1. A. S. Sedra and K. C. Smith, “Microelectronic circuits”, Oxford University Press, 2007.
2. P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1997.
3. H.W.Ott, “Noise Reduction Techniques in Electronic Systems”, Wiley, 1989.
4. W.C. Bosshart, “Printed Circuit Boards: Design and Technology”, Tata McGraw Hill, 1983.
5. G.L. Ginsberg, “Printed Circuit Design”, McGraw Hill, 1991.

EE 322C ELECTROMAGNETIC WAVES
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES:

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

1Analyse transmission lines and estimate voltage and current at any point on transmission line for different load conditions.

2Provide solution to real life plane wave problems for various boundary conditions.

3 Analyse the field equations for the wave propagation in special cases such as lossy and low loss dielectric media.

4Visualize TE and TM mode patterns of field distributions in a rectangular wave-guide.

5Understand and analyse radiation by antennas.

UNIT- I

TRANSMISSION LINES: Introduction, Concept of distributed elements, Equations of voltage and current, Standing waves and impedance transformation, Lossless and low-loss transmission lines, Power transfer on a transmission line, Analysis of transmission line in terms of admittances, Transmission line calculations with the help of Smith chart, Applications of transmission line, Impedance matching using transmission lines.

UNIT- II

MAXWELL'S EQUATIONS&UNIFORM PLANE WAVE: Basic quantities of Electromagnetics, Basic laws of Electromagnetics: Gauss's law, Ampere's Circuital law, Faraday's law of Electromagnetic induction. Maxwell's equations, Surface charge and surface current, Boundary conditions at media interface.

Homogeneous unbound medium, Wave equation for time harmonic fields, Solution of the wave equation, Uniform plane wave, Wave polarization, Wave propagation in conducting medium, Phase velocity of a wave, Power flow and Poynting vector.

UNIT- III

PLANE WAVES AT MEDIA INTERFACE: Plane wave in arbitrary direction, Plane wave at dielectric interface, Reflection and refraction of waves at dielectric interface, Total internal reflection, Wave polarization at media interface, Brewster angle, Fields and power flow at media interface, Lossy media interface, Reflection from conducting boundary.

UNIT- IV

WAVEGUIDES & ANTENNAS: Parallel plane waveguide: Transverse Electric (TE) mode, transverse Magnetic(TM) mode, Cut-off frequency, Phase velocity and dispersion. Transverse Electromagnetic (TEM) mode, Analysis of waveguide-general approach, Rectangular waveguides. Radiation parameters of antenna, Potential functions, Solution for potential functions, Radiations from Hertz dipole, Near field, Far field, Total power radiated by a dipole, Radiation resistance and radiation pattern of Hertz dipole, Hertz dipole in receiving mode.

Text/Reference Books

1. R. K. Shevgaonkar, **"**Electromagnetic Waves**"**, Tata McGraw Hill, 2005.
2. D. K. Cheng, "Field and Wave Electromagnetics**"**, Addison-Wesley, 1989.

3. M. N.O. Sadiku, “Elements of Electromagnetics**”**, Oxford University Press, 2007.
4. C. A. Balanis, “Advanced Engineering Electromagnetics”, John Wiley & Sons, 2012.
5. C. A. Balanis, “Antenna Theory: Analysis and Design**”**, John Wiley & Sons, 2005.

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EE 324C WIND AND SOLAR ENERGY SYSTEMS
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes:
At the end of this course, students will demonstrate the ability to
Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.
Understand the basic physics of wind and solar power generation.
Understand the power electronic interfaces for wind and solar generation.
Understand the issues related to the grid-integration of solar and wind energy systems.

UNIT-I

Physics of Wind Power:
History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions.

Solar thermal power generation:
Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis

UNIT-II

Wind generator topologies:
Review of modern wind turbine technologies,Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, PermanentMagnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.

UNIT-III

The Solar Resource:
Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

Solar photovoltaic:
Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms.Converter Control.

UNIT-IV

Network Integration Issues:
Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.

Text / References:
1. T. Ackermann, “Wind Power in Power Systems”, John Wiley and Sons Ltd., 2005.
2. G. M. Masters, “Renewable and Efficient Electric Power Systems**”,** John Wiley and Sons, 2004.

3. S. P. Sukhatme, “Solar Energy: Principles of Thermal Collection and Storage”, McGraw Hill, 1984.
4. H. Siegfried and R. Waddington, “Grid integration of wind energy conversion systems” John Wiley
and Sons Ltd., 2006.
5. G. N. Tiwari and M. K. Ghosal, “Renewable Energy Applications”, Narosa Publications, 2004.

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EE 326C ELECTRICAL ENERGY CONSERVATION AND AUDITING
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER-VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes:
At the end of this course, students will demonstrate the ability to
1. Understand the current energy scenario and importance of energy conservation.
2. Understand the concepts of energy audit.
3. Understand the methods of improving energy efficiency in different electrical systems.
4. Understand the concepts of improving energy efficiency in industrial systems.

UNIT-I

Energy Scenario (10 Hours)

Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features and the Energy Conservation Amendment Act, 2010, Schemes of BEE under Energy Conservation Act-2001, Electricity Act, 2003, Integrated Energy Policy.

UNIT-II

Energy Audit (10 Hours)

Definition and objectives of energy audit, need, types of energy audit, Energy audit approach understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

UNIT-III

Energy Efficiency in Electrical Systems (10 Hours)

Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, Assessment of Transmission and Distribution losses in power systems, estimation of technical losses in distribution system, Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

UNIT-IV

Energy Efficiency in Industrial Systems (12 Hours)

HVAC: factors affecting the performance and savings opportunities in HVAC, performance assessment of window, split and package air conditioning units, Fans and blowers: performance evaluation and efficient system operation, flow control strategies and energy conservation opportunities, Pumps and Pumping System: Types,

performance evaluation and energy conservation opportunities, Lighting System: Basic parameters and terms in lighting, methods of calculating illuminance, general energy saving opportunities, lighting case study.

Text/Reference Books

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online)
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-3, Electrical Utilities (available online)
3. S. C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991.
4. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

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EE 328C DIGITAL CONTROL SYSTEMS
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES:

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

1. Obtain discrete representation of LTI systems.
2. Analyse stability of open loop and closed loop discrete-time systems.
3. Design and analyse digital controllers.
4. Design digital compensator and discrete observer for LTI systems.

UNIT- I

INTRODUCTION: Terminology: continuous time, discrete-time & digital signals; Basic structure of digital control scheme and brief description of its blocks. Advantages & problems of digital control, General principles of signal conversion: operation by A/ D & D/A converters, A/D and D/A converter circuits; Sample and hold circuit: Mathematical analysis of sampling process, Ideal sampler, Choice of sampling frequency, Aliasing; Sampling theorem, The Hold operation, ZOH. Unit sample sequence, Unit step sequence & Unit sinusoidal sequence. Difference Equation models & Impulse response models for discrete time systems. State space models of discrete systems, state space analysis, Controllability, reachability, reconstructibility and observability analysis.

UNIT- II

TRANSFORM DOMAIN PROCESSING:; Definition of Z-transform; The Z-transforms of typical functions such as Unit sample sequence, Unit step sequence, sampled ramp function, sampled exponential function, sampled sinusoids; Operations with Z transform such as shifting (forward & backward); Z transform Inversion; Final value & Initial value theorems; Transfer function models; Unit delayer Transfer function; Dynamic response; Stability in z-plane; Jury Stability test; Z-plane poles v/ s stability (& the nature of response functions); Mapping s-plane to z-plane, Bilinear transformation.

UNIT- III

MODELS OF DIGITAL CONTROL DEVICES & SYSTEMS: z-domain description of sampled continuous-time plants, model of ADC & DAC, Interconnection of discrete-time & continuous time systems & their equivalent transfer functions; Implementation of digital controllers, Recursive realizations: direct, cascade & parallel realizations, Non-recursive realization; Digital PID controller: Positional & velocity forms; Tuning rules for digital PID. Design of digital control system with dead beat response. Practical issues with dead beat response design.

UNIT- IV

DESIGN OF DIGITAL CONTROL ALGORITHMS: Basic structure of digital control system; Routes to the design of digital Controller, z-plane specifications of control system design: steady state accuracy, Steady state errors & error constants for type -0,-1,-2 systems, Transient accuracy, dominant poles, Effect of extra zero & pole on discrete time 2nd order system; Digital compensator design using frequency response

plot; Digital compensator design using root locus plot. Design of discrete observer for LTI System. Design of set point tracker.

TEXT BOOK:

1. M. Gopal, “Digital Control Engg.”, New Age International Publishers, New Delhi.
2. M. Gopal, “Digital Control & State Variable Methods (Conventional and Intelligent Control System)”, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
3. G. F. Franklin, J. D. Powell and M. L. Workman, “Digital Control of Dynamic Systems”, Addison-Wesley, 1998.

REFERENCE BOOKS:

1. B.C. Kuo, “Digital Control Systems”, OXFORD UNIVERSITY PRESS.
2. K. Ogata, “Discrete-time Control Systems”, Pearson Education, New Jersey.
3. Phillips, C. L. & H. T. Nagle, Jr., “Digital Control System Analysis”, Pearson Education, New Jersey.
4. Hopis, C.H. and G.B. Lemont, “Digital Control System: Theory, Hardware & Software”, McGraw-Hill Publications, New York.

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EE 332C LINE-COMMUTATED AND ACTIVE PWM RECTIFIERS
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes:
At the end of this course, students will demonstrate the ability to Analyse controlled rectifier circuits.
Understand the operation of line-commutated rectifiers – 6 pulse and multi-pulse configurations.
Understand the operation of PWM rectifiers – operation in rectification and regeneration modes and lagging, leading and unity power factor mode.

UNIT-I

Thyristor rectifiers with passive filtering
Half-wave thyristor rectifier with RL and RC loads; 1-phase thyristor rectifier with L and LC filter; 3-phase thyristor rectifier with L and LC filter; continuous and discontinuous conduction, input current waveshape.

UNIT-II

Multi-Pulse converter
Review of transformer phase shifting, generation of 6-phase ac voltage from 3-phase ac, 6- pulse converter and 12-pulse converters with inductive loads, steady state analysis, commutation overlap, notches during commutation.

UNIT-III

Single-phase ac-dc single-switch boost converter
Review of dc-dc boost converter, power circuit of single-switch ac-dc converter, steady state analysis, unity power factor operation, closed-loop control structure.
Ac-dc bidirectional boost converter
Review of 1-phase inverter and 3-phase inverter, power circuits of 1-phase and 3-phase ac-dc boost converter, steady state analysis, operation at leading, lagging and unity power factors.

UNIT-IV

Rectification and regenerating modes. Phasor diagrams, closed-loop control structure.
Isolated single-phase ac-dc flyback converter
Dc-dc flyback converter, output voltage as a function of duty ratio and transformer turns ratio. Power circuit of ac-dc flyback converter, steady state analysis, unity power factor operation, closed loop control structure.

Text / References:
1. G. De, “Principles of Thyristorised Converters”, Oxford & IBH Publishing Co, 1988.
2. J.G. Kassakian, M. F. Schlecht and G. C. Verghese, “Principles of Power Electronics”, AddisonWesley, 1991.
3. L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.
4. N. Mohan and T. M. Undeland, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons, 2007.
5. R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science & Business Media, 2001.

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EE 334C HVDC TRANSMISSION SYSTEMS
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES:

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

1Understand the advantages of dc transmission over ac transmission.

2Understand the operation of Line Commutated Converters and Voltage Source Converters.

3Understand the control strategies used in HVdc transmission system.

4Understand the improvement of power system stability using an HVdc system

UNIT- I

DC TRANSMISSION TECHNOLOGY& ANALYSIS OF CONVERTERS: Comparison of AC and dc Transmission (Economics, Technical Performance and Reliability). Application of DC Transmission. Types of HVdc Systems. Components of a HVdc system.

Line Commutated Converter and Voltage Source Converter based systems.Line Commutated Converters (LCCs): Six pulse converter, Analysis neglecting commutation overlap, harmonics, Twelve Pulse Converters. Inverter Operation. Effect of Commutation Overlap. Expressions for average dc voltage, AC current and reactive power absorbed by the converters. Effect of Commutation Failure. Voltage Source Converters (VSCs): Two and Three-level VSCs. PWM schemes: Selective Harmonic Elimination, Sinusoidal Pulse Width Modulation. Analysis of a six pulse converter.

UNIT- II

CONTROL OF HVDC CONVERTERS: Principles of Link Control in a LCCHVdc system. Control Hierarchy, Firing Angle Controls– Phase-Locked Loop, Current and Extinction Angle Control, Starting and Stopping of a Link. Higher level Controllers Power control, Frequency Control, Stability Controllers. Reactive Power Control. Principles of Link Control in a VSC HVdc system: Power flow and dc Voltage Control. Reactive Power Control/AC voltage regulation.

UNIT- III

COMPONENTS OF HVDC SYSTEMS: Smoothing Reactors, Reactive Power Sources and Filters in LCC HVdc systems DC line: Corona Effects. Insulators, Transient Over-voltages. dc line faults in LCC systems. dc line faults in VSC systems. dc breakers. Monopolar Operation. Ground Electrodes.

UNIT- IV

STABILITY ENHANCEMENT USING HVDC CONTROL&MTDC LINKS: Basic Concepts: Power System Angular, Voltage and Frequency Stability. Power Modulation: basic principles – synchronous and asynchronous links. Voltage Stability Problem in AC/dc systems.

Multi-Terminal and Multi-Infeed Systems. Series and Parallel MTdc systems using LCCs.

MTdc systems using VSCs. Modern Trends in HVdcTechnology. Introduction to Modular

Multi-level Converters.

TEXT/REFERENCE BOOKS:

1. K. R. Padiyar, “HVDC Power Transmission Systems”, New Age International Publishers, 2011.
2. J. Arrillaga, “High Voltage Direct Current Transmission”, Peter Peregrinus Ltd., 1983.
3. E. W. Kimbark, “Direct Current Transmission”, Vol.1, Wiley-Interscience, 1971.

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EE 336C UTILIZATION OF ELECTRIC POWER AND TRACTION
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES:

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

1. Understand the construction and applications of electrical components.
2. Understand the various electrical heating and welding machines
3. Understand the principles and performances of different batteries.
4. Understand the principles and performances of traction motors and design calculations.

UNIT-I

Selection of Electrical Components:(12Hrs) Sizing of a transformer, main dimensions, kVA output for single- and three-phase, sizing and selection of motors (ac as well dc) cables sizing. SENSORS AND TRANSDUCERS: Temperature, pressure, displacement, velocity, acceleration, strain and torque type.

Medical equipments: X-ray machine - Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Electrical safety. Biological effects of X-rays and precautions.

UNIT-II

ELECTRIC HEATING & WELDING:(10Hrs) Principle and application of resistance, induction and dielectric heating., Resistance welding, arc welding, welding generator and welding transformer, properties of arcing electrode.

UNIT-III

ELECTROLYTIC PROCESS: (10Hrs) Principles and applications of electrolysis. Faraday's law of electrolysis, electroplating, charging and discharging. Different types of battery , Capacity and efficiency of battery, defects in battery, maintenance of battery.

UNIT-IV

ELECTRIC TRACTION: (12Hrs) Systems of electric traction, traction motors, traction motor control, multi unit control, braking of electric motors, thyristor control of electric traction., Types of services, speed time and speed distance curves, average and schedule speed, Estimation of power and energy requirements: specific energy consumption. Mechanics of train movement coefficient of adhesion, Adhesive weight, effective weight.

TEXT BOOKS:

1. Utilization of Electrical Energy : Open Shaw Taylor ; ELBS
2. Art and Science of Utilization of Electrical Energy : H. Pratab ; Dhanpat Rai & Sons, Delhi.

REFERENCE BOOKS:

1. Generation, Distribution and Utilization of Electrical Power : C.L. Wadhwa ; Khanna Pub.
2. H.Pratab,"Electric Traction", Dhanpat Rai & Sons.
3. Utlization of Electrical Energy, H.Partab, Dhanpat Rai

NOTE:

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EE 338C DIGITAL SIGNAL PROCESSING
B.TECH. (ELECTRICAL ENGINEERING, EEE)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES

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

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

UNIT - I

Discrete-time signals and systems: Classification of signals, Analog to digital conversion, sampling theorem, Nyquist rate, Digital to analogconversion of signal, Elementary discrete time signals, Classification of discrete time signals, Simple manipulations of discrete time signals, Discrete time systems and their classification, Response of LTI systems to arbitrary inputs by convolution, Properties of convolution, Stability of LTI systems, Discrete-time systems described by difference equations, Correlation of discrete-time signals.

UNIT - II

Z-transform: z-transform, Properties of z-transform, Poles and zeros of z-transform, Pole location and time-domain behaviour for causal signals, System function of LTI system, Inverse z-transform, Analysis of LTI systems in z-domain, One-sided z-transform.

Discrete Fourier Transform: Frequency domain sampling and reconstruction of discrete-time signals, Discrete Fourier transform, DFT as linear transformation, Properties of DFT, Fast Fourier transform algorithms: Radix-2 algorithms (Decimation in Frequency and Decimation in Time), Application of DFT in computation of linear and circular convolution.

UNIT - III

Design of digital filters: Implementation of discrete-time systems (FIR&IIR systems),Structures for FIR systems: direct-form, cascade-form and lattice, Structures for IIR systems:direct-form, cascade-form, parallel form and lattice-ladder.Design of FIR filters using windows method, Fourier series method and frequency-sampling methods. Design of IIR filters by approximation of derivatives, impulse invarianceand bilinear transformation methods. Commonly used analog filters (Butterworth, Chebyshev, Elliptic and Bessel).

UNIT - IV

Multirate digital signal processing: Introduction to multirate digital signal processing, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Interchange of downsamplers/upsamplers.

Applications of digital signal processing: Power Spectrum Estimation:Energy spectral density, Estimation of auto-correlation and power spectrum of random signals,Power spectrum estimation using non parametric methods (Barlett method, Welch and Blackman and Tukey method) and parametric methods (AR, MA, ARMA). Optimum filtering: Wiener filter, Kalman filter.

TEXT BOOKS:

1. J. G. Proakis and D. G. Manolakis, *Digital Signal Processing: Principles, Algorithms and Applications*, 4th Ed., Pearson Prentice Hall, 2007.
2. S. Salivahanan, *Digital Signal Processing*, 2nd Ed.,TataMcGraw Hill, 2010.

REFERENCE BOOKS:

1. Anand Kumar, *Digital Signal Processing*, 2nd Ed., PHI Learning Pvt. Ltd., 2015.
2. A. V. Oppenheim, R. W. Schafer and J. R. Buck,*Digital Signal Processing*, 2nd Ed., Pearson, 2007.
3. J. R. Johnson, *Introduction to Digital Signal Processing*, Prentice-Hall International, 1989.
4. B. Somanathan Nair, *Digital Signal Processing: Theory, Analysis & Digital Filter Design*,PHI Learning Pvt. Ltd., 2004.

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EE 342C SENSORS & TRANSDUCERS
B.TECH. (ELECTRICAL ENGINEERING)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes: After going through this course, the students shall be able to:

1. Familiarize with the construction and working principle of different types of sensors and transducers
2. Explain various measurement techniques for industrial applications based on transducers.
3. Choose proper sensors and transducers to make measurements of non-electrical quantities
4. Have an understanding of smart sensors and their application areas

UNIT-I

Introduction: Basic concepts of sensors and transducers and their classification, performance characteristics and choice of transducers, factors influencing the choice of transducers.

Resistive transducers: Types of resistive transducers Potentiometers, loading effect, construction of potentiometers, materials used for potentiometers; Strain gauges, theory of strain gauges, types of strain gauges, semiconductor strain gauges, Rossetts, Load cells. Thermistors, thermometers, thermocouples and their applications.

Inductive Transducers: Basic principle,Variable inductance transducers, Linear Variable Differential Transformer(LVDT),Rotary Variable Differential Transformer(RVDT), Synchros, control type synchro systems, synchros as torque transmitters.

UNIT-II

Capacitive Transducers: Transducers using change in area of plates, transducers using change in distance between plates, differential arrangement, variation of dielectric constant for measurement of displacement and liquid level, frequency response of capacitive transducers.

Piezoelectric Transducers: Principle of working, modes of operation of piezoelectric crystals, properties of piezoelectric crystals, equivalent circuit of piezoelectric transducers, loading effects and frequency response, impulse response of piezoelectric crystals.

OtherTransducers: Hall Effect transducers, photovoltaic cells, photoconductive cells, semiconductor photodiode, phototransistors. Transducers for measurement of angular velocity, Electrical tachometers, Electromagnetic tachometer generators, Digital methods, photoelectric tachometers, stroboscope and stroboscopic methods.

UNIT-III

Measurement of Non–Electrical Quantities: Pressure measurement, temperature measurement, flow measurement, Electromagnetic Flow meters, Ultrasonic Flow Meters, Thermal Meters, and Wire Anemometers. Measurement of Displacement, Measurement of Velocity/ Speed, Measurement of Acceleration, Measurement of Force, Measurement of Torque, Measurement of Shaft Power, Measurement of Liquid Level, Measurement of Viscosity.

Measurement of low pressure using various methods, Measurement of acceleration, flow, liquid level and humidity employing different transducers. Chemical sensors, measurement of pH values, measurement of thermal conductivity.

UNIT-IV

Data Acquisition Systems and Conversion: Introduction, Objectives and Configuration of Data Acquisition System, various types of Data Acquisition Systems, Data Conversion. Data acquisition in instrumentation systems.

Data Transmission and Telemetry: Introduction, Methods of Data/Signal Transmission, characteristics of Telemetry systems, Landline telemetry and Radio Frequency telemetry.

Smart Sensors: Introduction to smart sensors, components of smart sensors, General architecture of smart sensors, Evolution of Smart Sensors, Advantages, standards for smart sensor interface, Industrial applications of smart sensors. Introduction to Microelectromechanical Systems.

Text Books:

1. A.K.Sawhney,"A Course in Electrical and Electronics Measurement and Instrumentation,"Dhanpat Rai & Co.
2. J.S. Saini, "Textbook of Measurements and Instrumentation (With Experiments)", New Age International Publishers.
3. D. Patranabis, "Sensors and Transducers," PHI

Reference Books:

1. Data Acquisition and Signal Processing for Smart Sensors by Nikolay Kirianaki, Sergey Yurish, Nestor Shpak, Vadim Deynega, John Wiley & Sons Ltd.
2. D.V.S. Murty, "Transducers and Instrumentation", Prentice Hall India.
3. Helfrick Albert D. and Cooper W. D., "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall India.
4. David A. Bell "Electronic Instrumentation and Measurements", PHI / Pearson Education.

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EE 344C FUZZY SYSTEMS
B.TECH. (ELECTRICAL ENGINEERING)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes: After going through this course, the students shall be able to:

1. understand the nuances of the fuzzy set, distinct from crisp set.
2. understand the operations on Fuzzy sets.
3. understand the concepts of fuzzy inferencing.
4. apply the learnt concepts to further decipher the non-linearities in FLCs & to apply fuzzy systems theory to a practical problem.

UNIT-I

Introduction: Fuzzy sets; Key Distinctions from classical sets. Properties & operations on fuzzy sets. Membership Functions, their shapes and Elicitation methods. Fuzzy control from an industrial perspective, knowledge-based Systems (KBS), Early & key events in fuzzy systems development; knowledge representation in KBS's. Differentiating b/n Fuzzy Logic & Probability Theory**;** Vagueness.

UNIT-II

Fuzzy Mathematics: Classical or crisp relation; Fuzzy relations & operations on fuzzy relations, the Extension Principle, Classical Inference Rules, Classical Implication, N-valued Logic & Fuzzy Logic; Fuzzy propositions, Max-min, Max-product & Max-av Compositions; The Compositional Rule of Inference; Two types of Inference engine or rule firing: Composition based Inferencing & Individual rule based Inferencing. Different implications, Representing a set of rules.

UNIT-III

Fuzzy System Design Parameters: The Fuzzy System architecture (Mamdani Type & TSK Type), Rationale for Normalization, Choice of scaling factors, & Rationale for Denormalization; Choice of variables & content of rules, Derivation of rules, choice of membership functions, Choice of fuzzification procedure, choice of defuzzification procedure, comparison and evaluation of defuzzification methods.

UNIT-IV

Nonlinear Fuzzy System: The Fuzzy System as a Non-Linear Transfer Element, Types of Fuzzy System such as PID-like Fuzzy System, Sugeno FKBC; Distinctions between Mamdani & Sugeno Type Fuzzy Systems. One typical application of Fuzzy System.

Text Book:

1. D. Driankov, H.Hellendoorn & M. Reinfrank, "An Introduction to Fuzzy Control", Pub: Narosa Pub. House, New Delhi.

Ref. Books:

2. Abraham Kandel & Gidon Ingholz, "Fuzzy Control Systems", Narosa Book Distributors Pvt. Ltd., New Delhi.
3. Bart Kosko, "Neural Networks & Fuzzy Systems", PHI.
4. Timothy Ross, "Fuzzy Logic with Engineering Applications", TMH.

5. Hao Ying, “Fuzzy Control & Modeling: Analytical Foundations & Applications”, IEEE Press.
6. George J. Klir, et.al, “Fuzzy Sets, Uncertainty & Information”, PHI.

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EE 346C ANALOG AND DIGITAL COMMUNICATION
B.TECH. (ELECTRICAL ENGINEERING)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES:

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

UNIT-1

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

UNIT-2

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

UNIT-3

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

UNIT-4

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

TEXT BOOK:

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.

REFERENCE BOOKS:

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

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EE 348C OPTIMIZATION TECHNIQUES
B.TECH. (ELECTRICAL ENGINEERING)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES:

1. Understand the concepts of classical optimization techniques.
2. Understand the concepts of linear and nonlinear programming.
3. Understand the concepts of nonlinear constrained unconstrained optimization techniques.
4. Understand the concepts of Dynamic Programming.

Unit I

Introduction and Classical Optimization Techniques: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems. Classical Optimization Techniques: Single variable Optimization – multivariable Optimization without constraints – necessary and sufficient conditions for minimum / maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – multivariable Optimization with inequality constraint – Kuhn – Tucker conditions.

Unit II

Linear Programming: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems, linear simultaneous equations: Elimination method, Gauss and Gauss-Jordan method, Jacobi's method, Gauss-Seidal method, simplex method. Transportation problem finding initial basic feasible solution by north - west corner rule, least cost method and vogel's approximation method.

Unit III

Unconstrained Nonlinear Programming: One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method Unconstrained Optimization Techniques: Univariate method, Powell's method and steepest descent method.

Unit IV

Constrained Nonlinear Programming: Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method, Introduction to convex Programming Problem, Dynamic Programming

TEXT BOOK:

1. "Engineering optimization: Theory and practice" – by S. S. Rao, New Age International (P) Limited, 3rd edition, 1998

REFERENCE BOOKS:

1. "Optimization Methods in Operations Research and system Analysis" – K. V. Mital and C. Mohan, New Age International (P) Limited, 3rd edition, 1996
2. Operations Research – by Dr. S. D. Sharma
3. "Operations Research: An Introduction" – by H. A. Taha, PHI Pvt. Ltd., 6th edition
4. Linear Programming – by G. Hadley.

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HSMC 350C APPLICATIONS OF PSYCHOLOGY IN ENGINEERS LIFE
B.TECH. (ELECTRICAL ENGINEERING)
SEMESTER- VI

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

COURSE OUTCOMES: After going through this course, the students shall be able to:

1. Understand the different applications of psychology to everyday issues of life.
2. Understand the different social issues, workplace issues, and behavioural issues.
3. Understand how the knowledge gained from this course can be used in their personal and professional work life.
4. Understand the need of Psychology and Counselling.

Unit 1:

Introduction: Nature and fields.
Psychology in industries and organizations: Job analysis; fatigue and accidents in industries.

Unit 2:

Consumer behavior, Psychology and mental health: Abnormality, symptoms and causes psychological disorders.

Unit 3:

Psychology and Counseling: Need of Counseling, Counselor and the Counselee, Counseling Process, Areas of Counseling.

Unit 4:

Psychology and social behavior: Group, group dynamics, teambuilding, Prejudice and stereotypes; Effective Communication, conflict and negotiation.

Text Books:

1. Schultz, D. & Schultz, S.E. (2009). Psychology and Work Today (10th ed.). New Jersey:Pearson/Prentice Hall.
2. Butcher, J. N., Mineka, S., & Hooley, J. M. (2010). Abnormal psychology (14th ed.). New York: Pearson
3. Gladding, S. T. (2014). Counselling: A comprehensive profession. New Delhi: Pearson Education
4. Aronson, E., Wilson, T. D., & Akert, R. M. (2010). Social Psychology (7th Ed.). Upper Saddle River, NJ: Prentice Hall.

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Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
B.Tech. 4th YEAR ELECTRICAL ENGINEERING (SEMESTER – VII)

Choice Based Credit System Scheme Of Studies & Examinations w.e.f. 2021-22

Sl. No.	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credits	Duration of Exam
			L	T	P		Theory	Practical			
1	EE401C	Electric Drives	3	0	0	25	75	0	100	3	3
2	EE481C	Electric Drives Lab.	0	0	2	25	0	75	100	1	3
3	PE6	Program Elective - 6	3	0	0	25	75	0	100	3	3
4	PE7	Program Elective - 7	3	0	0	25	75	0	100	3	3
5	OE1	Open Elective - 1	3	0	0	25	75	0	100	3	3
6	OE2	Open Elective - 2	3	0	0	25	75	0	100	3	3
7	EE483C	Project Stage-1	0	0	8	25	0	75	100	4	3
8	EE451C	Professional Training (Level-3)	0	0	2	100	0	0	100	1	3
Total			**15**	**00**	**12**	**275**	**375**	**150**	**800**	**21**	

L= Lecture, T = Tutorial, P = Practical,& MC = Mandatory Course (Audit)

1. The students will be allowed to use non-programmable scientific calculator in the examination. However, Sharing/exchange of calculator is prohibited in the examination.
2. Electronics gadgets including Cellular phones are not allowed in the examination.

PROGRAM ELECTIVE-6 (PE6)

EE421C	Computational Electromagnetics
EE423C	Power Distribution System
EE425C	Image Processing (Prerequisite Subject: DSP)
EE427C	Wavelet Transforms

PROGRAM ELECTIVE-7 (PE7)

EE431C	Power System Protection
EE433C	High Voltage Engineering
EE435C	Control System Design
EE437C	Robotics

OPEN ELECTIVE-1 (OE1)

HUM350C	Communication Skills for Professionals (Except BME & BTE)
HUM352C	Soft Skills And Interpersonal Communication
MGT402C	Human Resource Management
MGT404C	Human Values, Ethics And IPR
HUM354C	Introduction To French Language
HUM356C	Introduction To German Language

OPEN ELECTIVE-2 (OE2)

CSE431C	Cyber Security
CSE305C	Computer Network
CHE457C	Industrial Safety
CE406C	Disaster Management
ECE327C	Consumer Electronics

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
B.Tech. 4th YEAR ELECTRICAL ENGINEERING (SEMESTER – VIII)
Choice Based Credit System Scheme Of Studies & Examinations w.e.f. 2021-22

Sl. No.	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credits	Duration of Exam
			L	T	P		Theory	Practical			
1	EE402C	Power System Dynamics & Control	3	0	0	25	75	0	100	3	3
2	PE8	Program Elective - 8	3	0	0	25	75	0	100	3	3
3	PE9	Program Elective - 9	3	0	0	25	75	0	100	3	3
4	OE3	Open Elective - 3	3	0	0	25	75	0	100	3	3
5	EE484C	Project Stage-II	0	0	16	25	0	75	100	8	3
6	EE482C	General Fitness for the Profession	0	0	0	0	0	100	100	0	3
Total			**12**	**00**	**16**	**125**	**300**	**175**	**600**	**20**	

OR

Sl. No.	Course Code	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credits	Duration of Exam
			L	T	P		Theory	Practical			
1	EE490C	Internship	0	0	28	250	0	250	500	20	3
2	EE482C	General Fitness for the Profession	0	0	0	0	0	100	100	0	3
Total			**00**	**00**	**28**	**250**	**0**	**350**	**600**	**20**	

L= Lecture, T = Tutorial, P = Practical,& MC = Mandatory Course (Audit)

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PROGRAM ELECTIVE-8 (PE8)

EE422C	Computational Intelligence
EE424C	Electric Power Quality & FACTS
EE426C	Machine Learning
EE428C	Internet of Things

PROGRAM ELECTIVE-9 (PE9)

EE432C	Advanced Control Systems
EE434C	Big Data Analysis
EE436C	Biomedical Instrumentation
EE438C	Advanced Instrumentation

OPEN ELECTIVE-3 (OE3)

CSE340C	Artificial Intelligence & Expert Systems
EE452C	Electrical and Hybrid Vehicles
MGT401C	Entrepreneurship
ME452C	Sustainable Manufacturing
CHE459C	Nano-Science and Nano-Technology
EE454C	Smart Grid

EE401C **ELECTRICAL DRIVES**

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER-VII

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes:

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

1. Understand concept, various parts, dynamics and closed loop schemes of electrical drives
2. Understand the characteristics of dc motors and induction motors.
3. Understand the principles of speed-control of dc motors and induction motors.
4. Understand the power electronic converters used for dc motor and induction motor

UNIT-I

Introduction (4 Hours): Electrical Drives: definition, components and classification, Advantages and limitations of semiconductor controlled Electrical drives. Choice/selection of electric drives motor.

Dynamics of Electrical Drives (4 Hours): Fundamental torque equation, speed torque conventions and multiqudrant operation, Equivalent values of drive parameters, components of load torque, steady state stability.

Control of Electrical Drives (2 Hours): Modes of operation, Requirement of closed loop control of drives and various closed loop control configurations.

UNIT-II

Selection of motor power rating (5 Hours): Heating and cooling, determination of motor rating, continuous, short time and intermittent duties, load equalization, determination of moment of inertia of the flywheel.

DC motor Drives (5 Hours): Review of emf and torque equations of DC machine, review of torque-speed characteristics of dc motor, change in torque-speed curve with armature voltage, load torque-speed characteristics, operating point, armature voltage control for varying motor speed, flux weakening for high speed operation.

UNIT III

DC motor Drives (6 Hours): Static control of dc motors. Converter fed dc drive & chopper fed dc drive. Four quadrant operation of dc machine; single-quadrant, two-quadrant and four-quadrant choppers; steady-state operation of multi-quadrant chopper fed dc drive, regenerative braking.

Induction motor Drives (4 Hours): Review of induction motor equivalent circuit and torque-speed characteristic, variation of torque-speed curve with (i) applied voltage, (ii) applied frequency and (iii) applied voltage and frequency, typical torque-speed curves of fan and pump loads, operating point, constant flux operation, flux weakening operation.

UNIT IV

Induction motor Drives (10 Hours): Review of three-phase voltage source inverter, generation of three-phase PWM signals, sinusoidal modulation, space vector theory, conventional space vector modulation; constant V/f control of induction motor.

Impact of rotor resistance of the induction motor torque-speed curve, operation of slip-ring induction motor with external rotor resistance, starting torque, power electronic based rotor side control of slip ring motor, slip power recovery.

Text / References:

1. Power Semiconductor Controlled Drives, G. K. Dubey, Prentice Hall, 1989.
2. Fundamentals of Electrical Drives, G. K. Dubey, CRC Press/ Narosa Publishing House, 2002.
3. Electric Drives: V.Subrahmaniyam TMH.
4. Electric Motor Drives: Modeling, Analysis and Control, R. Krishnan Prentice Hall, 2001.
5. Control of Electric Drives, W. Leonhard, Springer Science & Business Media, 2001.
6. Power Electronics and variable frequency drives- Technology and applications: Bimal K. Bose, Wiley India.
7. Modern Power Electronics and AC drives: Bimal K. Bose, Pearson.

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EE481C ELECTRIC DRIVE LABORATORY

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VII

L	T	P	Credits	Class-work Marks	: 25
0	0	2	1	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

LIST OF EXPERIMENTS:

1. Speed control of dc motor using dc chopper.
2. Speed control of dc motor using single-phase converter.
3. Speed control of dc motor using 3-phase converter.
4. Speed control of dc motor using single- phase dual converter.
5. Inverter fed single-phase induction motor drive.
6. CSI fed induction motor drive.
7. Speed control of single- phase induction motor using ac regulator.
8. Regenerative braking of dc motor using single- phase converter.
9. Speed control of single-phase induction motor using cycloconverter.
10. Static rotor resistance control method

Note:-

1 Total ten experiments are to be performed in the semester.

2 At least eight experiments should be performed from the above list. Remaining three experiments should be performed as designed and set by the concerned institution as per the scope of the syllabus.

EE421C COMPUTATIONAL ELECTROMAGNETICS

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VII

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

COURSE OUTCOMES:

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

1Understand the basic concepts of electromagnetics.

2Understand computational techniques for computing fields.

3 Apply the techniques to simple real-life problems.

UNIT- I

INTRODUCTION (10 hours): Conventional design methodology, Computer aided design aspects – Advantages. Review of basic fundamentals of Electrostatics and Electromagnetics. Development of Helmhotz equation, energy transformer vectors-Poynting and Slepian, magnetic Diffusion-transients and time-harmonic.

UNIT- II

ANALYTICAL METHODS & FINITE DIFFERENCE METHOD (FDM) (10 hours): Analytical methods of solving field equations, method of separation of variables, Roth'smethod, integral methods- Green's function, method of images.

Finite Difference schemes, treatment of irregular boundaries, accuracy and stability of FDsolutions, Finite-Difference Time-Domain (FDTD) method, Uniqueness and convergence.

UNIT- III

FINITE ELEMENT METHOD (FEM) (10 hours): Overview of FEM, Variational and Galerkin Methods, shape functions, lower and higher order elements, vector elements, 2D and 3D finite elements, efficient finite element computations.

UNIT- IV

SPECIAL TOPICS & APPLICATIONS (12 hours): Background of experimental methods-electrolytic tank, R-C network solution, Field plotting(graphical method), hybrid methods, coupled circuit - field computations, electromagnetic-thermal and electromagnetic - structural coupled computations, solution of equations, method of moments, Poisson's fields low frequency electrical devices, static/time-harmonic/transient problems in transformers, rotating machines, actuators, CAD packages.

Text/Reference Books.

1. P. P. Silvester and R. L. Ferrari "Finite Element for Electrical Engineers", Cambridge
University press, 1996.

2. M. N. O. Sadiku, "Numerical Techniques in Electromagnetics", CRC press, 2001

NOTE:

2. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines “AICTE Examination Reforms”. Students shall be informed about these reforms.

EE 423C **POWER DISTRIBUTION SYSTEM**

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VIII

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes:

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

5. Understand Power Distribution System, an important aspect of overall Electricity Supply System.
6. Understand the various components of power distribution systems.
7. Analyze the T&D losses in the power distribution system..
8. Understand the issues in the existing power distribution system.

UNIT-I

Introduction (10 Hours)

Introduction to sub-transmission and distribution system; classification of loads – residential, commercial, agricultural, industrial and their characteristics; distribution system planning – short-term, mid-term, long-term, Load scheduling & dispatch, Load balancing, load modeling and characteristics; definition of demand factor, utilization factor, load factor, plant factor, diversity factor, loss factor; computer applications to distribution system automation; tariff

UNIT-II

Electrical System Components (10 Hours)

Basic Distribution System, Components of the distribution system, Distribution feeders, transformers and sub-stations; primary feeders – voltage level, radial and loop types, Operation & Maintenance (O&M) objectives, Activities involved in O&M, Distribution transformers - Reasons for DT failures, design considerations for secondary system – voltage level, location of substation, rating, service area with primary feeders, existing system improvement.

UNIT-III

Power Distribution System Analysis (10 Hours)

System analysis – voltage drop and power loss calculation; methods of solution for radial networks, three-phase balanced primary lines, loss reduction, voltage regulation, voltage control and improvement, issues in quality of service – voltage sag, swell and flicker, power factor correction, economic justification for capacitor with cost-benefit analysis aiming at most economic power factor, optimum location of capacitor, Distribution sub-station bus schemes.

UNIT-IV

T&D losses in Power Distribution system (12 Hours)

Energy Accounting in power distribution system: Need, objectives & functions, Energy flow diagram in power distribution system, Concepts of T&D, AT&C losses in distribution system, factors contributing to high technical & commercial losses. Measures for Technical and commercial loss reduction, long term plans for technical loss reduction, case studies.

Text / References:

1. Turan Gonen, “Electric Power Distribution System Engineering”, McGraw Hill Dale
2. R. Patrick,” Electrical Distribution System”, 2nd Edition, CRC Press.
3. James A. Momoh, “Electric Power Distribution Automation, Protection and Control”, CRC Press.
4. A. S. Pabla, “Electric Power Distribution”, Tata McGraw Hill

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EE425C **IMAGE PROCESSING**

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VII

L	T	P	Credits	Class-Work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs.

COURSE OUTCOMES:

Students will be able to:

1. Apply suitable transform on the image for its analysis.
2. Enhance and restore the images using different types of filters and techniques as per the image.
3. Segment the image as per requirement and representing images in different color models.
4. Compress the image for different application.

UNIT - I

FUNDAMENTALS (12 hours): Basic introduction to digital image processing, Applications of DIP, Fundamental steps in DIP, Components of an image processing system, Elements of visual perception, Image sensing and acquisition, Basic concepts in sampling and quantization, Representing digital images, Spatial and intensity resolution, Image interpolation, Some basic relationships between pixels, Introduction to mathematical tools used in DIP.

UNIT – II

TWO DIMENSIONAL TRANSFORMS (12 hours): Basic geometric transformations, introduction to 2-dimensional systems and properties, Separable Image Transforms, 2D Fourier Transform, Discrete Cosine Transform, Wavelet Transform.

IMAGE ENHNACEMENT: Spatial Domain methods: Basic gray level transformation, Histogramequalization, Image subtraction, Image averaging, Spatial filtering: Smoothing, sharpening filters, Laplacianfilters, Frequency domain filters: Smoothing, Sharpening filters, Homomorphic filtering

UNIT – III

IMAGE RESTORATION (12 hours): Model of image degradation/restoration process, Noise models, Inverse filtering, Wiener filter, least mean square filtering, blind image restoration, Pseudo inverse, Singular value decomposition.

IMAGE SEGMENTATION (12 hours): Fundamentals of segmentation, Basics of point, line & edge detection, Thresholding: Basics of intensity thresholding, Role of noise, illumination and reflectance in image thresholding, Global thresholding.

UNIT – IV

IMAGE CODING AND COMPRESSION (12 hours): Lossless compression, Variable length coding, LZW coding, bit plane coding,predictive coding, DPCM, Lossy Compression: Transform coding, Wavelet coding, basics of Image compressionstandards: JPEG, MPEG, Basics of Vector quantization.

COLOUR IMAGE PROCESSING: Colour fundamentals, Colour models: The RGB Colour Model, The CMY and CMYK Colour models , The HSI Colour model; Conversion of colour models, Pseudo colour image processing: Intensity Slicing, Intensity to colour Transformations, Basics of Full Colour image processing

TEXT BOOKS:

1. Rafeal C.Gonzalez, Richard E.Woods, Digital Image Processing, Fourth Edition, Pearson Education/PHI, 2018.

REFERENCE BOOKS:

1. Anil K Jain, Fundamentals of digital image processing,PHI, 2005.
2. William K Pratt, Digital Image Processing, John Wiley, 2014.
3. Milan Soanka, Vaclav Hlavac and Roger Boyle, Digital Image Processing and Computer Vision, Cengage Learning, 2014.
4. Rafael C.Gonzalez, Richard E.Woods, Steven L. Eddins, Digital Image Processing using MATLAB, Pearson Education, 2004.

NOTE:

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EE427C **WAVELET TRANSFORMS**

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VII

L	T	P	Credits	Class-Work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs.

COURSE OUTCOMES:

Students will be able to:

1. Analyze the need for time frequency analysis.
2. Understand fundamentals of continuous and discrete wavelet transform.
3. Interpret multiresolution analysis.
4. Familiarize with different wavelet families.
5. Apply wavelet transform for various signal processing applications.

UNIT - I

Review of mathematical preliminaries (10 hours): Vector space, Functions and function spaces, Basis function, Review of Fourier theory and properties of Fourier transform, Short time Fourier transform, Heisenberg's uncertainty principle and time-frequency tiling, Introduction to wavelet transform, Continuous wavelet transform and its properties, Continuous versus discrete wavelet transform.

UNIT – II

Discrete Wavelet Transform (12 hours):Haar scaling functions and Function spaces, Translation and scaling of scaling function $\phi(t)$, Orthogonality of translates of $\phi(t)$, Function space V_0, Finer Haar Scaling Functions, Nested spaces, Haar wavelet function, Orthogonality of scaling and wavelet function, Normalization of haar bases at different scales, Refinement relation for orthogonal wavelet systems, Restrictions on filter coefficients, Designing orthogonal wavelet systems: Daubechies,Coiflet, Symlet wavelet system coefficients.

UNIT – III

Discrete Wavelet Transform and Relation to Filter Banks (12 hours): Signal decomposition using DWT, Relation with filter banks, Frequency response, Signal reconstruction: Synthesis from coarse scale to fine scale using DWT,Upsampling and filtering, Multiresolution Formulation of Wavelet Systems: Signal spaces, Scaling function, Multiresolution analysis, Wavelet function.

Introduction to Biorthogonal Wavelets: Biorthogonal wavelet systems, Signal representation using biorthogonalwavelet system, Biorthogonal analysis,Biorthogonal synthesis

UNIT – IV

Applications of Wavelet Transforms (12 hours): Wavelet Denoising, Speckle Removal, Edge detection and object isolation, Imagefusion, Object detection by wavelet transforms of projections, Communication applications: Scalingfunctions as signalling pulses, Discrete wavelet multi-tone modulation, Solving integral and

differential equations, Solving partial differential equations.

TEXT BOOKS:

1. K. P. Soman, K. I. Ramachandran, “Insight into Wavelets: From Theory to Practice”, Third Edition, PHI, 2004.
2. R. M. Rao and Ajit S. Bopardikar, “Wavelet Transform, Introduction to theory and Applications”, Addison-Wesley, 1998.
3. C. Sidney Burrus, Ramesh A. Gopinath and HaitaoGuo, “Introduction to Wavelets and Wavelet Transforms: A primer”, Prentice Hall, 1997.
4. S. S. Ray and A. K. Gupta, “Wavelet Methods for Solving Partial Differential Equations and Fractional Differential Equations,” CRC Press, 2018.

REFERENCE BOOKS:

1. Gilbert Strang and Truong Nguyen, “Wavelets and Filter banks”, Wellesley Cambridge Press, 1996.
2. I. Daubechies, “Ten lectures on wavelets”, CBMS-NSF, SIAM, 1982.
3. P. P. Vaidyanathan, “Multirate Systems and Filter Banks”, Pearson Education, 1993.
4. RobiPolikar, The Wavelet Tutorial: The Fundamental Concept and an Overview of the Wavelet Theory.

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EE431C **POWER SYSTEM PROTECTION**

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER-VII

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

COURSE OUTCOMES:

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

1. Understand the different components of a protection system.
2. Evaluate fault current due to different types of fault in a network.
3. Understand the protection schemes for different power system components.
4. Understand the basic principles of digital protection.
5. Understand system protection schemes, and the use of wide-area measurements.

UNIT- I

INTRODUCTION AND COMPONENTS OF A PROTECTION SYSTEM: (10 hours)

Fundamentals of Power system protection, philosophy of protective relays, Principles of Power System Protection, Instrument transformers, Circuit Breakers, Isolator etc,

Faults and Over-Current Protection: Review of Fault Analysis, Sequence Networks. Introduction to Overcurrent Protection and overcurrent relay co-ordination. Principle, operation and setting of over current relays.

UNIT- II

EQUIPMENT PROTECTION SCHEMES: (10 HOURS)

Directional, Distance, Differential protection, Transformer and Generator protection, Bus bar Protection, Bus Bar arrangement schemes.

Protection of transmission lines and busbars using differential, directional-overcurrent and distance relays, back-up protection, carrier relaying

UNIT- III

MODELING AND SIMULATION OF PROTECTION SCHEMES: (12 HOURS)

CT/PT modeling and standards, Simulation of transients using Electro-Magnetic Transients (EMT) programs. Relay Testing. **Digital Protection**: Computer-aided protection, Fourier analysis and estimation of Phasors from DFT. Sampling, aliasing issues.

UNIT-IV

SYSTEM PROTECTION (12 HOURS) :

Effect of Power Swings on Distance Relaying. System Protection Schemes. Under-frequency, under-voltage and df/dt relays, Out-of-step protection, Synchro-phasors,

Introduction to PMU and its use, Fault location: Phasor Measurement Units and Wide-Area Measurement Systems (WAMS). Application of WAMS for improving protection systems.

TEXT BOOK:

1. J. L. Blackburn, “Protective Relaying: Principles and Applications”, Marcel Dekker, New York, 1987.
2. Y. G.Paithankar and S. R. Bhide, “Fundamentals of power system protection”, Prentice Hall, India, 2010.

REFERENCE BOOKS:

1. A. G. Phadke and J. S. Thorp, “Computer Relaying for Power Systems”, John Wiley & Sons, 1988.
2. A. G. Phadke and J. S. Thorp, “Synchronized Phasor Measurements and their Applications”, Springer, 2008.
3. D. Reimert, “Protective Relaying for Power Generation Systems”, Taylor and Francis, 2006.

NOTE:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.
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EE433C HIGH VOLTAGE ENGINEERING

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VII

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

COURSE OUTCOMES:

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

1 Understand the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials.

2 Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.

3 Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.

4 Knowledge of how over-voltages arise in a power system, and protection against these over-voltages.

UNIT- I

BREAKDOWN IN GASES, LIQUID AND SOLID INSULATING MATERIALS (10 hours): Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge. Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

UNIT- II

GENERATION & MEASUREMENTS OF HIGH VOLTAGES AND CURRENTS (10 hours): Generation of high voltages, generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators. **Measurements:** Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements.

UNIT- III

LIGHTNING AND SWITCHING OVER-VOLTAGES (10 hours): Lightening phenomenon, theories for lightening, lightening stroke mechanism, Stepped leader, Dart leader, tower foot resistance, Lightning Surges. Switching over-voltages, Protection against over-voltages, Surge diverters, Surge modifiers.

UNIT- IV

HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS AND HIGH VOLTAGE LABORATORIES (10 hours): Various standards for HV Testing of electrical apparatus, IS, IEC standards, testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some

high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs.

TEXT BOOK:

1. M. S. Naidu and V. Kamaraju, “High Voltage Engineering”, McGraw Hill Education,
2013.
2. C. L. Wadhwa, “High Voltage Engineering”, New Age International Publishers, 2007.

REFERENCE BOOKS:

1. D. V. Razevig (Translated by Dr. M. P. Chourasia), “High Voltage Engineering Fundamentals”, Khanna Publishers, 1993.
2. E. Kuffel, W. S. Zaengl and J. Kuffel, “High Voltage Engineering Fundamentals”, Newnes Publication, 2000.
3. R. Arora and W. Mosch “High Voltage and Electrical Insulation Engineering”, John
Wiley & Sons, 2011.
4. Various IS standards for HV Laboratory Techniques and Testing.

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EE435C **CONTROL SYSTEMS DESIGN**

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VII

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

COURSE OUTCOMES:

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

1. understand various design specifications.
2. design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators).
3. design controllers using the state-space approach

UNIT- I

INTRODUCTORY CONCEPTS (10 hours):

A) DESIGN SPECIFICATIONS

Introduction to design problem and philosophy. Time domain and frequency domain design specification and its physical relevance. Effect of gain on transient and steady state response. Effect of addition of pole on system performance. Effect of addition of zero on system response.

B) DESIGN OF CLASSICAL CONTROL SYSTEM IN THE TIME DOMAIN

Need for compensation. Design of Lag, lead lag-lead compensator in time domain. Feedback and Feed forward compensator design. Feedback compensation. Realization of compensators.

UNIT- II

DESIGN OF CLASSICAL CONTROL SYSTEM IN FREQUENCY DOMAIN (10 hours):

Compensator design in frequency domain to improve steady state and transient response. Feedback and Feed forward compensator design using bode diagram.

UNIT- III

DESIGN OF PID CONTROLLERS (10 hours): Design of P, PI, PD and PID controllers in time domain and frequency domain for first, second and third order systems. Control loop with auxiliary feedback – Feed forward control.

UNIT- IV

CONTROL SYSTEM DESIGN IN STATE SPACE (12 hours): Review of state space representation. Concept of controllability & observability, effect of pole zero cancellation on the controllability & observability of the system, pole placement design through state feedback. Ackerman's Formula for feedback gain design. Design of Observer. Reduced order observer. Separation Principle.

TEXT BOOKS:

1. N. Nise, "Control system Engineering", John Wiley, 2000.
2. I. J. Nagrath and M. Gopal, "Control system engineering", Wiley, 2000.

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REFERENCE BOOKS:

1. 3. M. Gopal, "Digital Control Engineering", Wiley Eastern, 1988.
2. K. Ogata, "Modern Control Engineering", Prentice Hall, 2010.

3. B. C. Kuo, “Automatic Control system”, Prentice Hall, 1995.
4. J. J. D’Azzo and C. H. Houpis, “Linear control system analysis and design (conventional and modern)”, McGraw Hill, 1995.
5. R. T. Stefani and G. H. Hostetter, “Design of feedback Control Systems”, Saunders College Pub, 1994.

NOTE:

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3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

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EE437C **ROBOTICS**

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VII

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

Course objectives

1. To introduce robotics, actuators and drive systems.
2. Analysis of robot mechanism and planner kinematics.
3. Numerical analysis of Mathematics of Differential Motion and Statice.
4. Analysis and application of Force and Compliance Controls.

UNIT I

Introduction to Robotics (04 hours): Era of Industrial Robots, Creation of Robotics, Manipulation and Dexterity, Locomotion and Navigation.

Actuators and Drive Systems (06 hours): DC Motors, Dynamics of Single-Axis Drive Systems, Pulse width modulation (PWM), WM switching characteristics, Optical Shaft Encoders, Position measurement, Velocity estimate, Brushless DC Motors.

UNIT II

Robot Mechanisms (04 hours): Joint Primitives and Serial Linkages, Parallel Linkages.

Planar Kinematics (05 hours): Planar Kinematics of Serial Link Mechanisms, Inverse Kinematics of Planar Mechanisms, Kinematics of Parallel Link Mechanisms, Redundant mechanisms.

UNIT III

Differential Motion (05 hours): Differential Relationship, Properties of the Jacobian, Inverse Kinematics of Differential Motion.

Statice (06 hours): Free Body Diagram, Energy Method and Equivalent Joint Torques, Closed-Loop Kinematic Chains, Over-Actuated Systems.

UNIT IV

Dynamics (07 hours): Newton-Euler Formulation of Equations of Motion, Basic Dynamic Equations,Closed-Form Dynamic Equations, Physical Interpretation of the Dynamic Equations, Lagrangian Formulation of Robot Dynamics, Lagrangian Dynamics,Planar Robot Dynamics,Inertia Matrix, Generalized Forces,

Force and Compliance Controls (05 hours): Hybrid Position/Force Control,Architecture of Hybrid Position/Force Control System, Compliance Control, Task strategy, Compliance control synthesis.

Text books:

1. Asada, H., and J. J. Slotine. Robot Analysis and Control. New York, NY: Wiley, 1986. ISBN: 9780471830290

References:

1. MITOPENCOURSEWARE https://ocw.mit.edu/courses/mechanical-engineering/2-12-introduction-to-robotics-fall-2005/lecture-notes/

NOTE:

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

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EE 451C **PROFESSIONAL TRAINING (LEVEL-3)**

B.TECH. (ELECTRICAL ENGINEERING)

SEMESTER- VII

	Credits	Class Work	: 100
:	1	Total	: 100
		Duration of Exam	: 3 Hrs

At the end of 6th semester each student would undergo four weeks Professional Training in an Industry/ Institute/ Professional Organization/Research Laboratory etc. with the prior approval of the Training and Placement Officer of the University and submit in the department a typed report along with a certificate from the organization.

The typed report should be in a prescribed format.

The report will be evaluated in the 7th Semester by a Committee consisting of three teachers from different specialization to be constituted by the Chairperson of the department. The basis of evaluation will primarily be the knowledge and exposure of the student towards different processes and the functioning of the organization.

The student will interact with the committee through presentation to demonstrate his/her learning.

Teachers associated with evaluation work will be assigned 2 periods per week load.

COURSE OUTCOMES:

1. After the course is completed the student will have additional knowledge about professional attributes.
2. The students will develop a more professional outlook.
3. The students will know how to deal with time bound tasks in a more effective way.
4. The students will have more efficient attribute of multi-tasking.

EE483C PROJECT STAGE-I

B. Tech. Semester – VII (Electrical Engg.)

L	T	P	Credits	Class Work	:	25 Marks
-	-	8	4	Examination	:	75 Marks
				Total	:	100 Marks

Course Objectives:

1. To align student's skill and interests with a realistic problem or project
2. To understand the significance of problem and its scope.
3. Students will make decisions within a framework

Project involving design/ fabrication/ testing/ computer simulation/ case studies etc. will be evaluated through a panel of examiners consisting of the following:

Chairman of Department — Chairperson
Project coordinator — Member Secretary
Respective project supervisor — Member

The student will be required to submit two copies of his/her project report to the department for record (one copy each for the department and participating teacher).

Project coordinator will be assigned the project load of maximum of 2 hrs. per week including his own guiding load of one hr. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her.

The format of the cover page and the organization of the body of the report for all the B.Tech. will be finalized and circulated by the Dean, Faculty of Engineering and Technology.

Course Outcomes:

After completing the course the students will be able to:

1. Develop the professional quality of employing technical knowledge obtained in the field of Engineering & Technology.
2. Design and make analysis augmented with creativity, innovation and ingenuity.
3. Develop an understanding on how to work in actual industry environment.
4. Utilise the technical resources and write the technical report.

Open Elective-I

(Common for All Branches except Bio Technology and Bio-Medical Engg for all Semesters)

HUM 350 C Communication Skills for Professionals

B. Tech. Semester – VII (Electrical Engg., EEE)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Objectives:

1. To hone verbal and written communication
2. To acquaint students with multiple forms and formats of various technical and business reports
3. To develop competence for report writing with a focus on its techniques
4. To develop English Language Proficiency

UNIT I (Contact hours 8)

Mechanics of Report Writing: Objectives of Report Writing; Types of Reports on the basis of forms and content. Introduction to Formats of Reports; Structure of Reports: Front Matter, Main Body, Back Matter

UNIT II (Contact hours 10)

Writing Business and Technical Report: Preliminary Strategies for Report Writing: Data Collection, Report Planning, Use of Illustrations, Point Formation, Preparing Notes/Drafts Using Appropriate Formats: Memo Format, Letter Format, Manuscript Format, Printed Forms

UNIT III (Contact hours 10)

Oral Communication and Soft Skills: Group Discussions; Interviews for jobs: preparation and facing them Professional Presentations: Power Point Presentation, Oral Presentation, Role of Kinesics (Body Language) in Communication, General Etiquettes in Office areas, corporate lunch and dinner Handling, Telephone calls

UNIT IV (Contact hours 8)

Resumes and Job application: Writing of Resume--Chronological Resume and Functional Resume, Request for Reference/Recommendation, Writing Application Letters for Job; Writing Covering letter

RECOMMENDED READING

1. **Sharma,Sangeeta, and Binod Mishra. Communication Skills for Engineers and Scientists. PHI,2009.**
2. **Tyagi,Kavita, and Padma Mishra. Advanced Technical Communication. PHI, 2011.**
3. **Rizvi, M. Ashraf. Effective Technical Communication. McGraw Hill Education, 2014.**
4. **Kumar, Sanjay, and PushpLata. Communication Skills. OUP, 2011.**
5. **Raman, Meenakshi and SangeetaSharma.Communication Skills. OUP,2011.**
6. ***Bhatnagar, Nitin, and MamtaBhatnagar. Communicative English for Engineers and Professionals. Pearson Education, 2013.**
   (The soft copy of the book is available in the university library)
7. **Mitra,Barun K. Personality Development and Soft Skills. OUP,2011.**
8. **Kaul, Asha. Business Communication. PHI, 2nd Edition.**

9. **Namee, Patrick Mc. Success in Interviews: How to Succeed in any Job Interview, Ist Edition.**
10. **Argenti, Paul. Corporate Communication.6th Edition. McGraw Hill Education, 2012.**

Note:

In semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attempt only five questions selecting at least one question from each unit.

The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

For students admitted in B Tech 1st year (C-Scheme) in 2019 and all training students:

Examination and evaluations of students shall be conducted as per guidelines *AICTE Examinations reforms* covering the entire syllabus. The students shall be made aware about the reforms.

Course Learning Outcomes:

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

1. Get acquainted with multiple forms and formats of various technical and business reports
2. Develop competence for report writing with a focus on its complex writing techniques and procedures.
3. Develop their speaking skills with professional proficiency.
4. Equip themselves for Letter Writing Skills.

Open Elective-I

(Common for All Branches)

HUM 352 C Soft Skills and Interpersonal Communication

B. Tech. Semester – VII (Electrical Engg., EEE)

L	T	P	Credits			
3	0	0	3	**Class Work**	:	**25 Marks**
				Examination	:	**75Marks**
				Total	:	**100 Marks**
				Duration of Examination	:	**3 Hours**

Course Objective:

- To train students to learn Soft Skills and engage in a successful and fruitful Interpersonal Communication

UNIT I (Contact hrs 08)

Soft Skills: Introduction to Soft Skills & their classification, Importance of Soft Skills: Writing Resume/CV, Engaging in Group discussion, Appearing for Job interviews

UNIT II (Contact hrs 10)

Interpersonal Skills, Behaviour, Relationships and Communication: Development and Role of Effective Interpersonal Skills, Development of Effective Speaking and Listening Skills

UNIT III (Contact hrs 10)

Non-Verbal Elements in Interpersonal Communication: Role of Body Language, Paralinguistic Features, Proxemics/Space Distance and Haptics in Interpersonal Communication

UNIT IV (Contact hrs 08)

Personality Development for Personal and Professional Growth: Desirable Personality, Personality Types, Analysis of Personality Development (Freudian and Swami Vivekananda's Concept), Grooming Personality for Personal and Professional Life

RECOMMENDED READING:

1. **Mitra, Barun K. Personality Development and Soft Skills. Delhi: OUP, 2nd Edition, 2016.**
2. **Butterfield, Jeff.Soft Skills for Everyone. Cengage Learning, 2017.**
3. **Raman, Meenakshi and Sangeeta Sharma. Communication Skills. OUP, 2011.**
4. **Ramesh, Gopalaswamy and Mahadevan Ramesh. The ACE of Soft Skills, Pearson India,2010.**
5. **Ribbons, Geoff and Richard Thompson.Body Language.Hodder& Stoughton, 2007.**
6. **Sharma, Sangeeta and Binod Mishra.Communication Skills for Engineers and Scientists. PHI, 2017.**

Note:

In semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attempt only five questions selecting at least one question from each unit.

The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

For students admitted in B Tech 1st year (C-Scheme) in 2019 and all training students:

Examination and evaluations of students shall be conducted as per guidelines *AICTE Examinations reforms* covering the entire syllabus. The students shall be made aware about the reforms.

Course Learning Outcomes:

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

1. Know now how soft skills complement hard skills for career growth
2. Enhance communicative competence for professional enhancement
3. Learn desirable body language and other non-verbal elements in interpersonal communication
4. Groom personality for handling effectively various situations of personal and professional life

Open Elective-I

(Common for All Branches for all Semesters)

HUM 354 C Introduction to French Language

B. Tech. Semester – VII (Electrical Engg., EEE)

L	T	P	Credits			
3	0	0	3	**Class Work**	**:**	**25 Marks**
				Examination	**:**	**75Marks**
				Total	**:**	**100 Marks**
				Duration of Examination	**:**	**3 Hours**

Course Objectives:

1. To enable students to understand the elementary communication structures of French language
2. To enable students to know and learn elementary vocabulary and grammar of French language
3. To enable students to engage in simple dialogues in French language

UNIT I (Contact hours 10)

VOCABULAIRE: Les Salutations, Les jours de la semaine, Les moins de l'année, Les couleurs, Les professions, Les nombrescardinaux, Les lieux de la ville, Les nationalites, Personnesetobjetscaractéristiques d'un pays, Civilisation: France,de la sociétéfrancaise, les monuments, les fêtes

UNIT II (Contact hours 10)

GRAMMAIRE: Conjugation des verbeetre, avoir, aller; Conjugation des verbe –er, -ir, -re Masculin/feminine,Singulier/ pluriel, Accord des nomset des adjectives, Articles indéfinisetdéfines, Négation simple, Interrogation, Futurproche, On= Nous, Articles partitifsetcontractes, La date etl'heure

UNIT III (Contact hours 8)

ECRITURE (comprehension des écrits, Production écrite), Presentez- vous, Mon meuillierami, Ma famille, Carteset messages d'invitation, d'acceptationou de refus, Ecrives des scenes

UNIT IV (Contact hours 8)

COMPREHENSION (écouter, production orale): Se presenter à ungroupe, Parlez/ écoutezdevotreville, Parlez/écoutezdesesactivités de loisirs, Parlez /écoutez de vosgoûts, Demander/ donnerun explication, Identifier unepersonneouun objet, Demander/dire cequ'ona fait

RECOMMENDED READING

1. **Echo – A1 Methode de Francais, CLE International (Distributed in India by W. R. Goyal Publishers & Distributors, Delhi)**
2. **Connexions, niveau 1, Yves Loiseau and R_gineM_rieux(Goyal Publishers)**
3. **Alter Ego-1, Hachette (Distributed in India by W. R. Goyal Publishers & Distributors, Delhi)**

4. **Forum- Methode de Francais 1, Hachette (Distributed in India by W. R. Goyal Publishers & Distributors, Delhi)**
5. **450 Exercises de Grammaire, CLE International (Distributed in India by W. R. Goyal Publishers & Distributors, Delhi)**
6. **Audio- Video study material**
7. **Supplementary handouts**

Note:

In semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attempt only five questions selecting at least one question from each unit.

The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

For students admitted in B Tech 1st year (C-Scheme) in 2019 and all training students:

Examination and evaluations of students shall be conducted as per guidelines *AICTE Examinations reforms* covering the entire syllabus. The students shall be made aware about the reforms.

Course Learning Outcomes:

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

1. Familiarize with the basics of French language
2. Understand and express vocabulary and grammar through writing
3. Demonstrate understanding through simple dialogues in French

Open Elective-I

(Common for All Branches for all Semesters)

HUM 356 C Introduction to German Language

B. Tech. Semester – VII (Electrical Engg., EEE)

L	T	P	Credits			
3	0	0	3	**Class Work**	:	**25 Marks**
				Examination	:	**75Marks**
				Total	:	**100 Marks**
				Duration of Examination	:	**3 Hours**

Course Objectives:

1. To enable students to understand the elementary communication structures of German language
2. To enable students to know and learn elementary vocabulary and grammar
3. To enable students to engage in simple dialogues in German

UNIT I (Contact hours 10)

Introduction to German alphabets, Numbers 0- 100 (basic algebraic expressions), Vocabulary of days and months, Adverbs of time, Ordinal numbers in German, Phonetics and pronunciation

UNIT II (Contact hours 10)

Introduction to the simple possessive pronouns, Sentence: statement, question, (question for completion and decision) command, Coordination of clauses, Placing of the verb in the sentence: first, second and last place, Word order in main clause, Details of time, manner and place (casual)

UNIT III (Contact hours 8)

Verb: infinitive, imperative, indicative – Präsens, Perfekt, Präteritum of auxiliary and modal verbs, modal verbs (meaning, indicative Präsens&Präteritum, möchten), Verbs with prefixes – separable and inseparable, Nouns: Gender, plural, Nominative, Accusative, Dative Articles: Definite and Indefinite, Adjectives: predicative use

UNIT IV (Contact hours 8)

Day-to-day conversation in German: Introducing oneself and other, greeting and taking leave, Meeting people, Time and date, months and weekdays, Inquire and name the country of origin, languages, Introduce family members and friends

RECOMMENDED READING

1. **Tangram AktuellNiveau A1, Max HeuberVertag, Ismaning, 2005 (Published and distributed in India by German Book Depot, Delhi)**
2. **Netzwerk A1, KlettVerlag, Muenchen, 2013 (Published and distributed in India by German Book Centre, Delhi, 2015).**
3. **Sprachkurs Deutsch I &2. Diesterweg (Moritz) Verlag, Frankfurt am Main, 1989, (Published and distributed in India by Goyal Saab Publishers & Distributors, New Delhi)**
4. **Schuelerduden Grammatik, BibliographischesInstitutand F.ABrockhaus, 2000.**
5. **ThemenAktuell 1, Kursbuch, Max HeuberVerlag, Ismaning, Deutschland, 2003 (Published and distributed in India by German Book Centre, Delhi,2010).**
6. **Audio-video Study Material**
7. **Supplementary Handouts**

Note:

In semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attempt only five questions selecting at least one question from each unit.

The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

For students admitted in B Tech 1st year (C-Scheme) in 2019 and all training students:

Examination and evaluations of students shall be conducted as per guidelines *AICTE Examinations reforms* covering the entire syllabus. The students shall be made aware about the reforms.

Course Learning Outcomes:

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

1. Familiarize with the basics of German language
2. Understand and express vocabulary and grammar through writing
3. Demonstrate understanding through simple dialogues in German

Open Elective-I

MGT402C HUMAN VALUES, ETHICS AND IPR

B. Tech. Semester – VII (Electrical Engg., EEE)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Objectives:

To help the students appreciate the essential complementarities between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.

Unit-I

Human Values: Understanding the need, basic guidelines, Self Exploration - its content and process; 'Natural Acceptance' and Experiential Validation, Continuous Happiness and Prosperity- Human Aspirations, Right understanding, Relationship and Physical Facilities, Understanding Happiness and Prosperity correctly.

Unit-II

Different kinds of value: Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

Unit-III

Modern approach to the study of values: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding harmony in the Family, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman).

Unit-IV

Professional Ethics & IPR: Values in Work-life, Professional Ethics and Ethos, Code of conduct, Whistle Blowing, Corporate Social Responsibility.IPR: meaning, nature, scope and relevance of IPR. Kinds of IPR: Copyright, Patents, Trademark, Geographical Indication, Industrial design, Plant Variety. Benefits, Emerging dimensions and Rational for protection of IPR.

Suggested Readings:

1. **R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics, Excel Books, New Delhi**
2. **A.N. Tripathy, 2003, Human Values, New Age International Publishers.**
3. **E G Seebauer& Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.**

4. **M Govindrajan, S Natrajan& V. S Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.**
5. **S. B. Gogate, Human Values & Professional Ethics, Vikas Publishing House Pvt. Ltd., Noida.**

Reference Books

1. A Nagraj, 1998 JeevanVidyaekParichay, Divya Path Sansthan, Amarkantak.
2. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.
3. Prof. A.R.Aryasri, DharanikotaSuyodhana, Professional Ethics and Moral, Maruthi Publications.
4. A. Alavudeen, R.Kalil Rahman and M. Jayakumaran, Professional Ethics and Human Values, University Science Press.
5. Prof.D.R.Kiran, 2013, Professional Ethics and Human Values, Tata McGraw-Hill
6. Jayshree Suresh and B. S. Raghavan, Human Values And Professional Ethics, S.Chand Publications

Note:

In semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attempt only five questions selecting at least one question from each unit.

The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

For students admitted in B Tech 1st year (C-Scheme) in 2019 and all training students:

Examination and evaluations of students shall be conducted as per guidelines *AICTE Examinations reforms* covering the entire syllabus. The students shall be made aware about the reforms.

Course Outcomes:

At the end of the course:

1. Students will be able to understand the significance of value inputs in a classroom and start applying them in their life and profession
2. Understand and can distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Understand the role of a human being in ensuring harmony in society and nature.
4. Students will be aware of the significance of Intellectual Property as a very important driver of growth and development in today's world and to be able to statutorily acquire and use different types of intellectual property in their professional life.

Open Elective-I

MGT404C HUMAN RESOURCE MANAGEMENT

B. Tech. Semester – VII (Electrical Engg., EEE)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Objectives:

To help the students develop an understanding of the management of human resources and develop abilities and skills required to manage them.

Unit-I

Introduction – nature and scope of human resource management, HRM objectives and functions, HRM policies, HRM in globally competitive environment; strategic human resource management.

Unit-II

Acquiring human resources – Man power planning, Job evaluation, job analysis and job design. Recruitment: Sources, Methods, constraints & challenges, selection: objectives and process, placement and induction.

Unit-III

Developing human resources: Training: types, methods, training vs. development and evaluation of a training programme and training need assessment, career planning and development.

Unit-IV

Performance appraisal: methods, process and challenges of performance appraisal, performance appraisal vs. potential appraisal, Compensation: wages & salaries administration and factors influencing compensation levels.

Suggested Readings:

1. **Jyothi, Human Resource Management, Oxford University Press**
2. **Bohlander George and Scott Snell, Management Human Resources, Cengage, Mumbai**
3. **Bhattacharyya, Dipak Kumar, Human Resource Management, Excel Books, NewDelhi**
4. **Cascio Wayne F., Managing Human Resources, TMH, New Delhi**
5. **DeCenzo, David A, and Stephan P. Robbins, Fundamentals of Human Resource Management, Wiley India, New Delhi**
6. **Denisi, Angelo S, and Ricky W Griffin, Human Resource Management, Biztantra, New Delhi**

Note:

In semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attempt only five questions selecting at least one question from each unit.

The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

For students admitted in B Tech 1st year (C-Scheme) in 2019 and all training students:

Examination and evaluations of students shall be conducted as per guidelines *AICTE Examinations reforms* covering the entire syllabus. The students shall be made aware about the reforms.

Course Outcomes:

At the end of the course:

1. To have an understanding of the basic concepts, functions and processes of human resource management
2. To be aware of the role, functions and functioning of human resource department of the organizations.
3. To Design and formulate various HRM processes such as Recruitment, Selection, Training, Development, Performance appraisals and Reward Systems, Compensation Plans and Ethical Behavior.
4. Develop ways in which human resources management might diagnose a business strategy and then facilitate the internal change necessary to accomplish the strategy.

Open Elective-II
CSE431C CYBER SECURITY
B. Tech. Semester – VII (Electrical Engg., EEE)

L	T	P	Credits			
3	0	--	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Objectives:

1. To understand cyber crime and its laws.
2. To work with tools and methods used in cyber crime.
3. To understand the life cycle of digital forensics.
4. To learn and understand web threats, challenges and protection policies.

UNIT- I

Introduction To Cybercrime:- Cybercrime and Information Security, Classifications of Cybercrimes, The need for Cyber laws, The Indian IT Act Challenges to Indian Law and Cybercrime Scenario in India, Weakness in Information Technology Act and it consequences, Digital Signatures and the Indian IT Act, Cybercrime and Punishment; Technology, Students and Cyber law; Survival tactics for the Netizens, Cyber-offenses: Cybers talking, Cyber cafe and Cyber crimes, Botnets, Attack Vector, Cloud Computing;

UNIT- II

Tools And Methods Used In Cybercrime:- Proxy Servers and Anonymizers, Phishing and identity theft, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Stenography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow; Cybercrime: Mobile and Wireless Devices: Trends in Mobility, Attacks on Wireless Networks, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges, Registry Settings for Mobile Devices, Authentication Service Security Attacks on Mobile/Cell Phones

UNIT- III

Understanding Computer Forensics:- The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Computer Forensics and Stenography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Challenges in Computer Forensics, Forensics Auditing, Anti forensics.

UNIT- IV

Cyber security Organizational Implications:- Cost of Cybercrimes and IPR Issues, Web Threats for Organizations, Security and Privacy Implications from Cloud Computing, Social Media Marketing, Social Computing and the Associated Challenges for Organizations, Protecting People's Privacy in the Organization, Organizational Guidelines for Internet Usage, Safe Computing Guidelines and Computer Usage Policy, Incident Handling, Forensics Best Practices, Media and Asset Protection, Importance of Endpoint Security in Organizations.

TEXT/ REFERENCE BOOKS:

1. "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Nina Godbole, Sunit Belapur, Wiley India Publications, April, 2011.

Note:

In semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attempt only five questions selecting at least one question from each unit.

For students admitted in B Tech 1st year (C-Scheme) in 2019 and all training students:

Examination and evaluations of students shall be conducted as per guidelines *AICTE Examinations reforms* covering the entire syllabus. The students shall be made aware about the reforms.

Course Outcomes:

1. Able to demonstrate cyber crime its laws and related terms.
2. Work with SQL injection, DOS attacks etc.
3. Explain computer forensic, Network forensic cyber forensic.
4. Understand safe computing guidelines, usage policies and incident handling.

OPEN ELECTIVE-II

CSE305C COMPUTER NETWORKS

B. Tech. Semester – VII (Electrical Engg. & EEE)

L	T	P	Credits			
3	0	--	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Objectives:

1. To learn the concepts, vocabulary and techniques currently used in the area of computer networks.
2. To understand the concepts of the OSI model and the TCP/IP model.
3. To be familiar with wireless networking concepts
4. To be familiar with contemporary issues in networking technologies.

UNIT- I

OSI Reference Model and Network Architecture: Introduction to Computer Networks, Example Networks ARPANET, Internet, Private Networks, and Network Topologies: Bus, Star, Ring, Hybrid, Tree, Complete, Irregular –Topology; Types of Networks: Local Area Networks, Metropolitan Area Networks, Wide Area Networks; layering architecture of networks, OSI model, Functions of each layer, Services and Protocols of each layer.

UNIT-II

TCP/IP: Introduction, History of TCP/IP, Layers of TCP/IP, Protocols, Internet Protocol, Transmission Control Protocol , User Datagram Protocol, IP Addressing, IP address classes, Subnet Addressing, Internet Control Protocols, ARP, RARP, ICMP, Application Layer, Domain Name System, Email – SMTP, POP,IMAP; FTP, NNTP, HTTP, Overview of IP version 6.

UNIT-III

Local Area Networks: Introduction to LANs, Features of LANs, Components of LANs, Usage of LANs, LAN Standards, IEEE 802 standards, Channel Access Methods, Aloha, CSMA, CSMA/CD, Token Passing, Ethernet, Layer 2 & 3 switching, Fast Ethernet and Gigabit Ethernet, Token Ring, LAN interconnecting devices: Hubs, Switches, Bridges, Routers, Gateways.

UNIT-IV

Wide Area Networks: Introduction of WANs, Routing, Congestion Control, WAN Technologies, Distributed Queue Dual Bus (DQDB), Synchronous Digital Hierarchy (SDH)/ Synchronous Optical Network (SONET), Asynchronous Transfer Mode (ATM), Frame Relay, Wireless Links

I**ntroduction to Network Management:** Management, Class of Service, Quality Firewalls, VLANs, Proxy Servers.

Remote Monitoring Techniques: Polling, Traps, Performance of Service, Security management, Digital signatures, SSL

Text Book/ Reference Books:

1. **Computer Networks (3rd edition), Tanenbaum Andrew S., International edition, 1996.**
2. **Data Communications, Computer Networks and Open Systems (4th edition), Halsall Fred, 2000, Addison Wesley, Low Price Edition.**
3. **Business Data Communications, Fitzgerald Jerry, Computer Networks – A System Approach, Larry L. Peterson & Bruce S. Davie, 2nd Edition.**

Note:

In semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attempt only five questions selecting at least one question from each unit.

For students admitted in B Tech 1st year (C-Scheme) in 2019 and all training students:

Examination and evaluations of students shall be conducted as per guidelines *AICTE Examinations reforms* covering the entire syllabus. The students shall be made aware about the reforms.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Understand the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of networks.
2. Apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.
3. Design a network routing for IP networks.
4. Demonstrate proper placement of different layers of ISO model and illuminate its function and determine proper usage of the IP address, subnet mask and default gateway in a routed network.

Open Elective-II

CHE457C : INDUSTRIAL SAFTEY

B. Tech. Semester – VII (Electrical Engg., EEE)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Objectives:

The purpose of this course is

1. To teach the students the concept of industrial safety and provide useful practical knowledge for workplace safety.
2. To identify, evaluate control the hazards to prevent or mitigate harm or damage to people, property and the environment.
3. To understand about fire and explosion, preventive methods, relief and its sizing methods
4. To analyze industrial hazards and its risk assessment

UNIT-I

Introduction: Concept of loss prevention, origin of process hazards, types of process hazards, acceptable risks, accident and loss statics, nature of accident process, concepts of inherent safety in plants or Factories, dose Vs response curve, toxicants entry route, thresh limit values, safety regulations.

UNIT-II

Hazards: Fire, Chemical (industrial and laboratory scale), electrical, mechanical, biohazards (natural and anthropogenic), toxic materials, their types and preventive measures, Liquid and vapor phase hazardous methods, storage and handling, containment, precautions, Personal safety precautions.

UNIT-III

Risk management principles, risk analysis techniques, risk control, hazards operability studies, hazard analysis, Fault tree analysis, Consequences analysis, human error analysis, accidental error analysis, economics of risk management, check list, reliability theory, event tree, HAZOP, safety reviews, what if analysis.

UNIT-IV

Safety audit, procedure for safety auditing, audit report, safety report, safety training, emergency planning and disaster management, introduction to security risk factors tables.

TEXT BOOKS:

1. **Chemical Hazards and safety, 2nd Edition, DawandeDenet& Co. , 2012**
2. **Loss preventions in process industries, Lees Butterworth-Heinemann, 1980.**
3. **Industrial safety Handbook, William and Handley, McGraw Hill.**

REFERENCE BOOKS:

1. Safety and Hazard management in Chemical Industries, Vyas, Atlantic 2013.
2. Industrial safety, health environment & Security, Basudev Panda, Laxmi publication ISBN- 97893-81159-43-9
3. Industrial Safety and Health Management, 4th Edition, C. Ray Asfahl, Prentice Hall International Series, 1984

4. Industrial Accident Prevention : A Safety Management Approach, Herbert William Heinrich

NOTES:

1. **Part A: Till academic session 2020-2021:**In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting at least one question from each unit.
   Part B: From Academic Session 2021-2022 onwards: For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 6-7 short answer type questions, will be compulsory & based on the entire syllabus. Rests of the eight questions are to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit. All questions will carry equal marks.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:
   Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Course Outcomes:

Students will be able to:

1. Analyze the effect of release of toxic substances.
2. Understand the industrial laws, regulations and source models.
3. Understand the methods of hazard identification and preventive measures and develop safety programs to prevent the damage or loss.
4. Conduct safety audits and improve safety practices.

Open Elective-II

CE406C : DISASTER MANAGEMENT

B. Tech. Semester – VII (Electrical Engg., EEE)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Unit-I

Introduction to Disaster Management: Disaster, Emergency, Hazard, Mitigation, Disaster Prevention, Preparedness and Rehabilitation, Risk and Vulnerability, Classification of Disaster, Natural and Man-made Disasters, International day and Decade of Disaster Reduction.

Risk and Vulnerability to disaster mitigation and management options: Warning and Forecasting.

Unit-II

Hydro-meteorological based disasters I: Disaster Management Act 2005, Role of NDMA, NDRF, NIDM, Tropical Cyclones, Floods, droughts, mechanism, causes, role of Indian Metrological Department, Central Water Commission, structure and their impacts, classifications, vulnerability, Early Warning System, Forecasting, Flood Warning System, Drought Indicators, recurrence and declaration, Structural and Non-structural Measures.

Hydro-meteorological based disasters II: Desertification Zones, causes and impacts of desertification, Characteristics, Vulnerability to India and Steps taken to combat desertification, Forest Fires; Causes of Forest Fires; Impact of Forest Fires, Prevention.

Unit-III

Geological based disasters: Earthquake, Reasons, Compression, Shear, Rayleigh and Love Waves; Magnitude and Intensity Scales, Direct and Indirect Impact of Earthquake; Seismic Zones in India, Factors, Indian Standards Guidelines for RCC and Masonry Structures, Prevention and Preparedness for Earthquake, Tsunamis, Landslides and avalanches: Definition, causes and structure; past lesson learnt and measures taken; their Characteristic features, Impact and prevention, Atlas (BMTRPC); structural and non-structural measures.

Unit-IV

Manmade Disasters I: Chemical Industrial hazards; causes and factors, pre- and post-disaster measures; control; Indian Standard Guidelines and Compliance;

Traffic accidents; classification and impact, Fire hazards; Classification as per Indian Standards;

Fire risk assessment; Escape routes; fire-fighting equipment; classification of buildings, fire zones, occupancy loads; capacity and arrangements of exits,

Use of remote sensing and GIS in disaster mitigation and management.

Text Books:

1. **Thomas D. Schneid., Disaster Management and Preparedness, CRC Publication, USA, 2001**
2. **Patrick Leon Abbott, Natural Disasters, Amazon Publications, 2002**

3. **Ben Wisner., At Risk: Natural Hazards, People vulnerability and Disaster, Amazon Publications, 2001**
4. **Oosterom, Petervan, Zlatanova, Siyka, Fendel, Elfriede M., "Geo-information for Disaster Management", Springer Publications, 2005**
5. **Savindra Singh and Jeetendra Singh, Disaster Management, Pravalika Publications, Allahabad**
6. **NidhiGaubaDhawan and AmbrinaSardar Khan, Disaster Management and Preparedness, CBS Publishers & Distribution**

Reference Books:

1. Selected Resources Published by the National Disaster Management Institute of Home Affairs, Govt. of India, New Delhi.

Note:

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Course Outcomes:

At the end of the course, the student will be able to:

1. Knowledge of the significance of disaster management,
2. Analyze the occurrences, reasons and mechanism of various types of disaster
3. Understand the preventive measures as Civil Engineer with latest codal provisions
4. Apply the latest technology in mitigation of disasters

Open Elective-II

ECE327C Consumer Electronics

B. Tech. Semester – VII (Electrical Engg., EEE)

L	T	P	Credits			
3	0	0	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Unit I (12 Lectures)

Monochrome TV (Introduction): Elements of a TV System, Picture transmission, Sound transmission, Picture reception, Sound reception, Synchronization, Receiver control, Image continuity, Scanning Process, Aspect Ratio, Flicker, Composite Video Signal, Picture Elements, Kell factor, Vertical Resolution, Horizontal Resolution, Video bandwidth, Interlacing, 625 Line System, Bandwidths for TV Transmission, Vertical and horizontal synch detail, Vestigial Side Band transmission(Advantages and Disadvantages)

Monochrome TV (Picture and Camera Tubes): Monochrome picture tube, beam reflection, Beam focusing, Screen Phosphor, Faceplate, Picture tube characteristics, picture tube circuit controls, Monochrome Camera Tubes: Basic principle, Image Orthicon, Vidicon, Plumbicon

Unit II (12 Lectures)

Colour TV Essentials: Compatibility , Colour perception, Three Colour theory, Luminance, Hue and Saturation, Dispersion and Recombination of light, Primary and secondary colours, luminance signal, Chrominance Signal, Colour picture tube, colour TV Camera, Colour TV display Tubes, colour Signal Transmission, Bandwidth for colour signal transmission, Colour TV controls. Cable TV, Block Diagram and principle of working of cable TV.

Plasma and LCD: Introduction, liquidcrystals, types of LCD's,TN, STN, TFT, Power requirements, LCD working, Principle of operation of TN display, Construction of TN display, Behaviour of TN liquid crystals, Viewing angle, colour balance, colour TN display, limitatons, advantages, disadvantages, applications.

Unit III (10 Lectures)

LED and DMD : Introduction to LED Television , comparison with LCD and Plasma TV's, schematic of DMD, introduction to Digital Micro Mirror device, Diagram of DMD, principle of working, emerging applications of DMD.

Microwave Ovens and Air Conditioners: Microwaves, Transit Time, Magnetron, Waveguides, Microwave Oven, Microwave Cooking. Air conditioning, Components of air conditioning systems, all water Air conditioning systems, all air conditioning Systems, Split air conditioner.

Unit IV (11 Lectures)

Microphones: Introduction, characteristics of microphones, types of microphone: carbon, movingcoil, wireless, crystal, introduction to tape recorder.

Loudspeaker: Introduction to ideal and basic loudspeaker, loudspeaker construction types of loudspeaker: Dynamic and permanent magnet, woofers, tweeters, brief introduction to baffles, equalisers.

Text Books :

1. **Consumer Electronics by S. P. Bali, Pearson Education.**

2. **Complete Satellite and Cable T.V by R.R Gulati, New Age International Publishers**

Reference Books:

1. Monochrome and ColourTelevision by R. R. Gulati, New Age International Publishers

Note:

In semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attempt only five questions selecting at least one question from each unit.

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

1. Identify and explain basic working of electronics products like TV, Microphone, loudspeaker, AC, Microwave ovens.
2. Learn various components of composite video signal and differentiate between line, brightness, saturation and to design the lower power consumption device, the primary challenge is how to minimize overall cost.
3. Acquire ability to design different display screen so that effect of radiations on eyes will be reduced.
4. Understand the general importance of product safety to consumers & producers will reduce the various adverse impacts of these devices on common man.

EE402C **POWER SYSTEM DYNAMICS & CONTROL**

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VIII

L	T	P	Credits	Class-Work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs.

OUTCOMES: At the end of this course, students will demonstrate the ability to understand the problem of power system stability and its impact on the system. Model different power system components for the study of stability, methods to improve stability.

UNIT-I

Modeling of Synchronous Machines and Associated Controllers (10hours): Modeling of synchronous machine: Physical Characteristics, Rotor position dependent model, D-Q Transformation, Flux equations, Voltage equations, Steady State Analysis Performance, Transient analysis. Conversion of one frame to other frame of reference. Modeling of rotor circuit in d-q frame of reference. Modeling of Prime Mover Systems. Modeling of induction machine. General Load Modeling.

UNIT-II

Stability Analysis (10hours): Stability problem of synchronous generator connected to Infinite Bus System. Operation States of power Systems, Swing Equations. Power angle curve. Equal Area Criterion:- Description of the phenomena of loss of synchronism in a single-machine infinite bus system following a disturbance like a three--phase fault, fault clearance angle and fault clearance time.

UNIT-III

Transient Stability and Torsional Oscillations (12hours): Analysis using numerical integration of swing equations using step by step method. Angular Stability in multi-machine systems. Dynamic Analysis of Swing equation with unregulated synchronous machine and considering the effect of damper winding and Governor's action. Intra-plant, Local and Inter-area modes. Methods of enhancing power transfer capability of Power system. Problems associated with compensation of Transmission line. Sub Synchronous Resonance phenomena, Torsional Oscillations, Counter measure to SSR problems.

UNIT-IV

COMPENSATION (10hours): SVC compensation Systems, Controlled Series Compensation, SSS compensation, Modeling of Transmission line with SSSC, UPFC and its modeling, Thyristor controlled phase shift transformer, Power flow modeling of transmission line, Modeling of transmission line with TCSC

TEXT BOOKS:

1. K.R. Padiyar, "Power System Dynamics, Stability and Control", B. S. Publications, 2002.
2. P. Kundur, "Power System Stability and Control", McGraw Hill, 1995.
3. P. Sauer and M. A. Pai, "Power System Dynamics and Stability", Prentice Hall, 1997.

4. S. K. Gupta, “ Power System Operation & Control”, Wiley Publication 2019.

REFERENCE BOOKS:

5. A A Fouad, “ Power System Control & Stability, Galgotia Publications
6. Power Generation, operation and control by Alen J. Wood by Wiley

NOTE:

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EE422C COMPUTATIONAL INTELLIGENCE

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VIII

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

Aim of this course is to provide the students with the knowledge and skills required to design and implement effective and efficient Computational Intelligence solutions to problems for which a direct solution is impractical or unknown. Specifically, students will acquire the basic concepts of fuzzy, evolutionary and neural computation. The expression computational intelligence (CI), commonly considered a synonym of soft computing, usually refers to the ability of a computer to learn a specific task from data or experimental observation.

Course Objectives:

1. Know the scope of Computational Intelligence (CI), and the types of tasks that can be tackled with CI methods
2. Know the most important modern computational intelligence techniques
3. Learn the fundamentals of neural computation and apply them effectively to develop correct and efficient solutions to a computational intelligence task.
4. Learn the fundamentals of evolutionary computation and apply them correctly to develop correct and efficient solutions to computational intelligence tasks.
5. Learn the fundamentals of fuzzy computation and apply them correctly to develop correct and efficient solutions to computational intelligence tasks

UNIT-I

Introduction (08 hours): Introduction to Computational Intelligence: definition and paradigms. Soft computing v/s hard computing. Brief historical sketch. Overview and basic concepts / characteristics of Intelligence and computational intelligence, modern application examples.

UNIT-II

Foundations of Neural Computation (12 hours):

Introduction to neural computation; Adaptation, Self-organization and Evolution; Biological and artificial neuron; Neural Networks Basic Concepts; Single Layer perceptron; Multilayer perceptron; Concepts of learning; Supervised and unsupervised learning; Back propagation networks; Neural network models; Architectures and training algorithms. Learning and generalization.

UNIT-III

Foundations of Evolutionary Computation (10 hours):

Introduction to evolutionary computation; Evolutionary processes in nature, Fitness Function; Classical Genetic operators; Evolutionary optimization algorithms; Genetic algorithms; Evolution Strategies.

UNIT-IV

Foundations of Fuzzy Computation (12 hours):

Introduction to fuzzy computation; Fuzzy sets and fuzzy systems; Properties of fuzzy sets; Membership functions; Structure / Block Diagram of Fuzzy System; Fuzzy inference systems: composition-based inference and Individual-rule-based Inference.

TEXT BOOKS/ REFERENCES:

1. Russell C. Eberhart and Yuhui Shi, Computational Intelligence: Concepts to Implementations, Morgan Kaufmann Publishers, 2007.
2. Andries P. Engelbrecht, Computational Intelligence: An Introduction, Wiley Publishing.
3. David Poole, Alan Mackworth, Randy Goebel, "Computational intelligence: A logical approach," Oxford University Press.
4. A Konar, "Computational Intelligence: Principles, Techniques and Applications", Springer - Verlag, 2005.
5. J.S. Saini, Editor Proceedings of STTP on Fuzzy Control; Aug. 2004.
6. Simon Haykin, Neural Networks: A Comprehensive Foundation, Prentice Hall
7. David E. Goldberg, Genetic Algorithm in Search Optimization and Machine Learning, Pearson Education.
8. S. Rajeskaran, G.A. Vijaylakshmi Pai, "Neural Networks, Fuzzy Logic, Genetic Algorithms Synthesis and Applications".
9. J.S. Roger Jang, C.T.Sun, E. Mizutani, "Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning & Machine Intelligence", PHI, 2002.
10. Computational intelligence in biomedical engineering - Begg, R.; Lai, D.T.H.; Palaniswami, M, CRC/Taylor & Francis, 2008.
11. Neural networks and learning machines - Haykin, S, Prentice Hall, 2009.
12. Evolutionary algorithms in theory and practice: evolution strategies, evolutionary programming, genetic algorithms - Bäck, T, Oxford University Press, 1996.
13. Laurence Fausett, "Fundamentals of Neural Networks",Prentice Hall,1994.
14. Timothy J Rose, "Fuzzy Logic with Engineering Applications", Third Edition, Wiley, 1995.

Web links

- IEEE Computational Intelligence Society http://cis.ieee.org/

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EE424C ELECTRIC POWER QUALITY & FACTS

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER-VIII

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	:3 Hrs

Course Outcomes:

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

1. Understand the basic concepts of power quality.
2. Understand voltage sag, Interruptions, Transient overvoltages with their applications.
3. Understand Power Quality Monitoring objectives, equipments and Evaluation
4. Understand the working principles of FACTS devices to improve power quality and their operating characteristics.

UNIT-I

Introduction to Electric Power Quality (10 Hours): Power Quality, Concern in Power System, Power Quality Problems: Transient and Steady state variations in voltage and frequency. Unbalance, Sags, Swells, Interruptions, Wave-form Distortions: harmonics, noise, notching, dc-offsets, fluctuations, Flicker etc., Tolerance of Equipment: CBEMA curve. Standards of Power Quality and their applications.

UNIT- II

Voltage Sags and Interruptions (5 Hours): Sources of Sags and Interruptions, Fundamental Principles of Protection, Solutions at End User Level, Comparison of Different Ride-Through Alternatives.

Transient Overvoltages (5 Hours): Sources of Transient Overvoltages, Principles of Overvoltage Protection, Devices for Overvoltage Protection, Strategies for Utility System Lightning Protection, Switching Transient Problems with Loads.

UNIT- III

Harmonics (5 Hours): Harmonics Distortion, Power System Quantities under Nonsinusoidal Conditions, Harmonic Indices, Harmonics Sources from Commercial and Industrial Loads, Effects of Harmonic Distortion on Power System Equipments.

Power Quality Monitoring and Evaluation (5 Hours): Power Quality Monitoring and its Objective, Power Quality Measurement Equipments, Power Quality Evaluation, Different Power Quality Indices used in Power Quality Evaluation.

UNIT- IV

FACTS-Electric Power Quality Conditioner (10 Hours):

Principle of operation and applications of:Passive filters, Active Filters, Static VAR Compensator (STATCOM), Dynamic Voltage Restorer(DVR), Unified Power Quality Conditioner (UPQC).

Text / References:

1. Electric Power Systems Quality : R.C. Dugan, M. F. McGranaghan and H.W. Beaty, McGraw-Hill.
2. Power System Harmonics: J. Arrillaga, D.A. Bradely and P.S. Bodger, Wiley.
3. Electric Power Quality: G.T. Heydt, Stars in a Circle.
4. Embedded Generation: N. Jenkins, R. Allan, P. Crossley, D. Kirschan and G. Strbac, IEEE Power and Energy Series.
5. Power Quality: C. Sankaran, CRC press.
6. Understanding FACTS: Concepts and Technology of FACTS System, N. G. Hingorani and L. Gyugyi, Wiley-IEEE Press.
7. IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems, IEEE Std. 519, 1992.
8. IEEE Recommended Practices on Monitoring Electric Power Quality, IEEE Std.1159, 1995.

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EE426C **MACHINE LEARNING**

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VIII

L	T	P	Credits	Class-Work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs.

COURSE OUTCOMES:

Students will be able to:

1 Design neural network to solve classification and function approximation problems.

2 Build optimal classifiers using genetic algorithms.

3 Comprehend probabilistic methods for learning.

4 Apply reinforcement learning for classification and prediction tasks.

UNIT - I

SUPERVISED LEARNING (12 hours)**:** Basics of machine learning, Artificial neural network, k-Nearest neighbour classifier, Support vector machine classifier, Decision tree classifier, Naive Bayes classifier, Bagging,Boosting, Improving classification with the AdaBoost meta algorithm.

UNIT – II

UNSUPERVISED LEARNING (10 hours)**:** Clustering: K-means clustering, Gaussian mixture model, EM algorithm for Gaussian mixture model; Dimensionality reduction: Principal component analysis, Independent component analysis, Factor analysis, EM algorithms for factor analysis.

UNIT – III

GENETIC ALGORITHMS (10 hours)**:** Basics of genetic algorithm, Representing hypotheses, Genetic operators, Fitness function and selection, Population evolution, Genetic programming, Representing programs, Models of evolution and learning: Lamarckian evolution and Baldwin effect.

UNIT – IV

REINFORCEMENT LEARNING (11 hours)**:** Markov decision process (MDP), Bellman equations, Value iteration and policy iteration, Linear quadratic regulation, Linear Quadratic Gaussian, Q-learning, Value function approximation, Policy search, Reinforce, Partially observable Markov decision process

TEXT BOOKS:

1. E. Alpaydin, Introduction to Machine Learning, MIT Press, 2009.
2. P. Langley, Elements of Machine Learning, Morgan Kaufmann, 1995.
3. T. M. Mitchell, Machine Learning, McGraw-Hill, 1997.

REFERENCE BOOKS:

Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

C. Bishop, Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.

P. Harrington, Machine learning in action, Manning Publications Co, 2012.

Csaba Szepesvári, Algorithms for Reinforcement Learning, Morgan & Claypool, 2010.

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EE428C **INTERNET OF THINGS**

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VIII

L	T	P	Credits	Class-Work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs.

COURSE OUTCOMES:

Students will be able to:

1. Interpret the effect and challenges posed by IoT networks leading to new architecturalmodels.
2. Compare and contrast the deployment of smart objects and the technologies to connect themto network.
3. Appraise the role of IoT protocols for efficient network communication.
4. Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

UNIT - I

INTRODUCTION TO IOT (10 hours): What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT andIoT, IoT challenges, IoT network architecture and design, Drivers behind newnetwork architectures, Comparing IoT architectures, A simplified IoT architecture,The core IoT functional stack, IoT data management and compute stack.

UNIT – II

SMART OBJECTS (12 hours): The “Things” in IoT, Sensors, Actuators, and Smart objects, Sensornetworks, Connecting smart objects, Communications criteria, IoT accesstechnologies.

IP AS IOT NETWORK LAYER: Business case for IP, The need for optimization,Optimizing IP for IoT, Profiles and compliances, Application protocols for IoT, Transport layer, IoT application transport methods.

UNIT – III

DATA AND ANALYTICS FOR IOT (12 hours): An introduction to data analytics for IoT, Machinelearning, Big data analytics tools and technology, Edge streaming analytics,Network analytics.

SECURING IOT: A brief history of OT security, Common challengesin OT security, How IT and OT security practices and systems vary, Formal riskanalysis structures: OCTAVE and FAIR, Phased application of security in anoperational environment.

UNIT – IV

IMPLEMENTATION OF IOT (12 hours): IoT physical devices and endpoints - Arduino UNO: Introduction to Arduino, ArduinoUNO, Installing the software, Fundamentals of Arduino programming. IoTphysical devices and endpoints- RaspberryPi: Introduction to RaspberryPi, About theRaspberryPi board: Hardware layout, Operating systems on RaspberryPi, ConfiguringRaspberryPi, Programming RaspberryPi with Python, Wireless temperature monitoringsystem

using Pi, DS18B20 temperature sensor, Connecting Raspberry Pi via SSH,Accessing temperature from DS18B20 sensors, Remote access to RaspberryPi, Smartand connected cities, An IoT strategy for smarter cities, Smart city IoT Architecture,Smart city security architecture, Smart city use-case examples.

TEXT BOOKS:

David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton and Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Cisco Press, 2017.

K. G. Srinivasa, G. M. Siddesh, Raju R. Hanumantha, Internet of Things, Cengage Learning India Pvt. Ltd., 2017

Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet ofThings: Introduction to a New Age of Intelligence", 1st Edition, Academic Press,2014.

REFERENCE BOOKS:

Peter Waher, Learning Internet of Things, PACKT publishing, 2015.

Bernd Scholz-Reiter, Florian Michahelles, Architecting the Internet of Things, Springer, 2011.

Daniel Minoli, Building the Internet of Things with IPv6 and MIPv6: The EvolvingWorld of M2M Communications, Willy Publications, 2013.

Vijay Madisetti and ArshdeepBahga, Internet of Things (A Hands-onApproach), 1st Edition, VPT, 2014.

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EE432C **ADVANCED CONTROL SYSTEMS**

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VIII

L	T	P	Credits	Class-Work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs.

COURSE OUTCOMES: After successful completion of the course, the students will be able to

- Analyze the physical systems in State Variable Form
- Design modern control systems with state observers
- Analyze the linear and nonlinear systems using Phase Plane Approach and Describing Function method.
- Design the Optimal Controller using Lyapunov's method.

UNIT-I

STATE VARIABLE TECHNIQUES (10 hours): Concept of state, state variables and state model, non-uniqueness of state variables, state models for linear continuous time systems, mathematical modeling of physical and electrical systems in state space, State variable representation of systems using physical variables, phase variables and canonical variables .derivation of transfer function from state model, Diagonalization, Vander Monde matrix, important properties of eigen values of a matrix, generalized eigenvectors, Solution of state equations, state transition matrix, properties of state transition matrix, methods of computing state transition matrix.

UNIT-II

ANALYSIS AND DESIGN OF MODERN CONTROL SYSTEMS (11 hours): Concepts of Controllability and observability of control systems, Gilbert's, Kalman's, Factors cancellation and Popov-Belevitch-Hautus (PBH) methods to test controllability and observability of continuous time systems, Duality property, similarity transformation matrix from controllability matrix and observability matrix, pole placement design through state feedback, state observer, design of state observer, condition for the existence of observer, full order state observer, minimum order observer, design of control systems with observers, Ackermann's Formula.

UNIT-III

PHASE PLANE ANALYSIS (06 hours): Concept of phase plane and Phase plane portrait. Method of isoclines and Delta method for constructing phase plane trajectories, phase plane portrait of linear and nonlinear second order systems, concept of limit cycles and singular points, stability analysis of nonlinear systems using phase plane analysis. Salient features of nonlinear control systems, Overview of various nonlinear components.

DESCRIBING FUNCTION ANALYSIS (05 hours): Definition, limitations, Derivation of describing function for ideal relay, relay with hysteresis and dead zone, saturation/coulomb friction, backlash and other nonlinear components, use of describing function for stability analysis of control systems.

UNIT-IV

LYAPUNOV'S STABILITY ANALYSIS (07 hours): First and second method of Lyapunov, significance of Lyapunov function, Construction of Lyapunov Functions using different methods, Lyapunov stability definitions, various stability theorems of Lyapunov for linear and nonlinear systems,Lyapunov's stability analysis of discrete time linear systems.

OPTIMAL CONTROL (05 hours): Concept of optimal control systems, Performance Indices, quadratic performance index, relationship between quadratic performance index and Lyapunov function, state regulator problem, output regulator problem, state regulator design using Lyapunov equation. Riccati equation, Optimal digital control systems.

TEXT BOOKS:

1. Digital Control & State Variable Methods: M.Gopal ; TMH.
2. Control Systems Engineering: Nagrath & Gopal, New Age Publisher.
3. Modern Control Engineering: Katsuhiko Ogata, Fifth Edition, Pearson Education

REFERENCE BOOKS:

1. Modern Control Theory: M.Gopal; Wiley International.
2. Applied non-linear control: J.E.Slotine & W.P.Li; Prentice Hall, USA,
3. ModernControl Theory: K.R.Varmah, CBS Publishers
4. Modern Control Engineering: D. Roy Choudhury, PHI

PROGRAM OUTCOMES:

1. Graduates shall be able to stay abreast with recent developments in the field of Electrical Engineering.
2. Graduates shall possess critical thinking abilities, problem solving skills and familiarity with the necessary computational tools and procedures.
3. Graduates shall have the ability to pursue research and provide innovative solutions.
4. Graduates shall continue to upgrade the skills and possess the motivation for continuing education and professional growth.

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EE434C **BIG DATA ANALYSIS**

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VIII

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

COURSE OUTCOMES:

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

1. explain different issues involved in the design and implementation of a database system.
2. explain the physical and logical database designs & modeling.
3. identify Big Data and its Business Implications.
4. explain the algorithms for dealing with big data.
5. manage job Execution in Hadoop Environment.

UNIT- I

DATABASE SYSTEM ARCHITECTURE: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

DATA MODELS: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

UNIT-II

RELATIONAL QUERY LANGUAGES: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS – MYSQL.

RELATIONAL DATABASE DESIGN: Domain and data dependency, Armstrong's axiom, Normal forms, Dependency preservation, Lossless design.

QUERY PROCESSING AND OPTIMIZATION: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

UNIT- III

INTRODUCTION TO BIG DATA AND HADOOP: Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Spark, Analysing Data with Hadoop.

HDFS (HADOOP DISTRIBUTED FILE SYSTEM): Design of HDFS, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression and Serialization.

UNIT- IV

MAP REDUCE & CLASSIFICATION METHODS:

MAP REDUCE: Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Overview of Clustering – K-means: Use Cases–Overview of the Method, Determining the Number of Clusters, Diagnostics – Reasons to Choose and Cautions, Classification: Decision Trees

Introduction to streams concepts and NoSQL databases

TEXT BOOKS:

- "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
- "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
- "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education
- "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley
- Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
- Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
- Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications,CRC press, 2013.

REFERENCE BOOKS:

- Anand Rajaraman and Jef rey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.
- Glen J. Myat, "Making Sense of Data", John Wiley & Sons, 2007
- ArvindSathi, "BigDataAnalytics: Disruptive Technologies for Changing the Game", MC Press, 2012

NOTE:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

NOTE: For examiner for paper setting:-

In semester examinations, examiner is required to set up question paper covering the entire syllabus in accordance with the examination reforms circulated by the AICTE & approved under item No. 14_18 of academic council.

EE436C BIOMEDICAL INSTRUMENTATION

B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VIII

L	T	P	Credits	Class-work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	:100
				Duration of Examination	3 Hrs

COURSE OUTCOMES:

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

5. evaluate the performance of Bio-medical instruments.
6. make use of bio-medical measurements and monitoring systems.
7. use telemetry in medical applications.
8. use computer networks in healthcare.

UNIT- I

INTRODUCTORY CONCEPTS (08 hours):

a. Introduction: Role of technology and biomedical Engineers in modern healthcare, origin of Bio signals, classification of biomedical instruments, performance parameters of instruments, basics of anatomy and physiology of the body.

b. Bioelectric potentials: Action and resting potentials, propagation of action potential, Physiological potentials- EEG, ECG, EMG, etc. and Evoked responses

UNIT- II

BIO-POTENTIAL ELECTRODES, AMPLIFIERS AND MEASUREMENTS SYSTEMS (12 hours):

a. Electrode theory, Bio-Potential electrodes-Electrode-Electrode interface, Half-cells and their potentials, Silver-Silver chloride electrodes, biomedical Recording electrodes, circuit model of electrode. Bioelectric amplifiers-carrier amplifiers, chopper amplifiers, phase sensitive or lock-in amplifiers, isolation amplifiers, instrumentation amplifiers, Microelectrodes.

b. Cardiovascular Measurements: Electrocardiography (ECG): Electrodes and leads, ECG recorders, ECG System for stress testing, Blood pressure measurement, Heart sound measurement, Pacemakers and Defibrillators.

UNIT- III

PATIENT CARE AND MONITORING SYSTEMS (12 hours):

a. Elements of intensive care monitoring, displays, diagnosis, Calibration of patient monitoring equipment. Sensory and behavioral measurements & patient monitoring systems. audiometer, galvanic skin Response (GSR), biofeedback instrumentation.

b. Computer-assisted patient monitoring system: Bedside monitors, central monitors ., measurement of heart rate, measurement of blood pressure, measurement of respiratory rate, impedance pnuemography, apnea detectors, Intelligent patient monitoring: Intelligent monitoring system architecture.

UNIT- IV

DIGNOSTIC TECHNIQUES AND BIO- TELEMETRY (10 hours):

a. Ultrasonic diagnosis, Ecocardiology, Eco-encephalography, Ophthalmic scans, X-ray & Radio-isotope diagnosis and therapy, CT-Scan, MRI.

b. Telemedicine & Medical Informatics. Components of a Bio-telemetry system, Telemedicine and its applications: Teleradiology, telecardiology, telepsychiatry, teledermatology, telesurgery, advantages and disadvantages of telemedicine. Hospital Information systems, Computer Networks in healthcare.

TEXT BOOKS:

1. R.S. Khandpur, “Handbook of Biomedical Instrumentaion,” TMH.
2. Mandeep Singh, “Introduction to Biomedical Instrumentation,” PHI.
3. Cromwell, “Biomedical Instrumentation and Measurements”, PHI

REFERENCE BOOKS:

1. Rangayyan , “Biomedical Signal Analysis: A case-study Approach,” Wiley.
2. Webster, “Bioinstrumentation,” Wiley.
3. Webster, “Medical Instrumentation: Application and Design,” Wiley.
4. Carr, “Introduction to biomedical equipment technology,” Pearson.
5. S. Ananthi, “A Text Book of Medical Instruments (2005)”, New Age International.
6. Pandey & Kumar,” Biomedical Electronics and Instrumentation”, Kataria

NOTE:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines “AICTE Examination Reforms”. Students shall be informed about these reforms.

EE438C **ADVANCED INSTRUMENTATION**
B.TECH. (ELECTRICAL ENGINEERING, EEE)

SEMESTER- VIII

L	T	P	Credits	Class-Work Marks	: 25
3	0	0	3	Exam Marks	: 75
				Total Marks	: 100
				Duration of Examination	3 Hrs.

COURSE OUTCOMES:

Students will be able to:

Select and use correct sensors for their different applications.
Do the representation and analysis of signals acquired through sensors.
Design new and robust sensors using basic principles of measurement.
Make use of virtual instruments in different industrial applications.
Extract the correct information from the sensor signals.

UNIT - I

SENSORS FUNDAMENTALS(12 hours): Sensor Classification, Thermal Sensors, Humidity Sensors, Capacitive Sensors, Planar Electromagnetic Sensors, Light Sensing Technology, Moisture Sensing Technology, Sensors Parameters, Range, Sensitivity, Accuracy, Stability, Repeatability, Static and Dynamic Characteristics, Energy Harvesting, Compensation due to change of temperature and other environmental parameters, Selection of Sensors, Factors affecting performance of sensors, Effect of temperature, Degradation of Sensors.

UNIT – II

SELF GENERATING SENSORS(12 hours): Thermoelectric Sensors, Thermocouples: reversible thermoelectric effects, common thermocouples, practical thermocouple laws, cold junction compensation in thermocouple circuits; Piezoelectric Sensors: piezoelectric effect, piezoelectric materials, applications; Pyroelectric Sensors: pyroelectric effect, pyroelectric materials, radiation laws, applications; Photovoltaic Sensors: photovoltaic effect, materials and applications; Electrochemical Sensors; Introduction of Intelligent Sensors, Classification, Smart Sensors, Cogent Sensors, Soft or Virtual Sensors, Self-adaptive Sensors, Self-validating Sensors, VLSI Sensors, Temperature compensating Intelligent Sensors, Indirect Sensing. **UNIT – III**

SENSOR SIGNAL PROCESSING TECHNIQUES(12 hours): Normalization, Feature extraction, Dimensionality reduction, Signal processing techniques for information extraction from sensor data: Deriving information from sensor data, Finding patterns in sensor data, Classifying sensor data, Detecting trends, Characterizing sensor data, Annotation Methods. Digital Signal Conditioning in Instrumentation: Introduction, Digital filters and z-transform, Some simple DSP Algorithms, Discrete and Fast Fourier Transforms and their applications: Use of data windows to improve spectral resolution, Use of DFT to characterize random signals and noise, Fast Fourier Transform, Digital routines for interpolating

discrete data, Estimating missing data at sampling instants.

UNIT – IV

VIRTUAL INSTRUMENTATION(12 hours): Introduction to Graphical System Design, Graphical System Design (GSD) Model:Design, Prototype and Deployment, Design flow with GSD, Virtual Instrumentation, Comparison of Virtual Instrument and Traditional Instrument, Role of Hardware in Virtual Instrumentation, Role of Software in Virtual Instrumentation, VirtualInstrumentation for Test, Virtual Instrumentation for Industrial I/O and Control, Virtual Instrumentation for Design, Virtual Instrumentation in the Engineering Process, Research and Development, Development Test and Validation, Manufacturing Test,Virtual Instruments beyond Personal Computer, Graphical Programming and Textual Programming.

TEXT BOOKS:

S. C. Mukhopadhyay, *Intelligent Sensing, Instrumentation and Measurements*, Springer, 2013.

R. Pallas-areny and J. G. Webster, *Sensors and Signal Conditioning*, 2nd Ed., John Wiley & Sons, 2001.

M. Bhuyan, *Intelligent Instrumentation: Principles and Applications*, CRC Press, 2011.

R. B. Northrop, *Introduction to Instrumentation and Measurements*, 3rd Ed., CRC Press, 2014.

J. Jerome, *Virtual Instrumentation using LabVIEW*, PHI Learning Private Limited, 2010.

REFERENCE BOOKS:

D.Placko, *Fundamentals of Instrumentation and Measurement*, ISTE Ltd., 2007.

M. J. Usher and D. A. Keating,*Sensors and Transducers: Characteristics, Applications, Instrumentation, Interfacing*, 2nd Ed., 1996.

NOTE:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

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OPEN ELECTIVE-III

CSE340C ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM

B. Tech. Semester – VIII (Electrical Engg., EEE)

L	T	P	Credits			
3	0	--	3	Class Work	:	25 Marks
				Examination		75Marks
				Total		100 Marks
				Duration of Examination		3 Hours

Course Objectives:

1. To understand the basic concepts of AI and problem solving
2. To analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search techniques to solve them
3. To represent knowledge and draw inferences
4. To explore learning techniques and existing expert systems

UNIT- I

Introduction: The AI problems; what is an AI technique; Characteristics of AI applications Problem Solving, Search and Control Strategies General Problem solving; Production systems; Control strategies: forward and backward chaining Exhaustive searches: Depth first Breadth first search.

UNIT- II

Heuristic Search Techniques: Hill climbing; Branch and Bound technique; Best first search and A* algorithm; AND/OR Graphs; Problem reduction and AO* algorithm; Constraint Satisfaction problems Game Playing Minmax search procedure; Alpha-Beta cutoffs; Additional Refinements

UNIT- III

Knowledge Representation & Reasoning:- Propositional logic, First order predicate logic, Inference in FOPL, Skolemnisation; Resolution Principle and Unification; Forward & Backward chaining, Inference Mechanisms Horn's Clauses; Semantic Networks; Frame Systems and Value Inheritance; Conceptual Dependency

UNIT- IV

Learning Techniques: - Supervised and unsupervised learning, Decision trees, Statistical learning models, Reinforcement learning.

Expert Systems: Introduction to Expert Systems, Architecture of Expert Systems; Expert System Shells; Knowledge Acquisition; Case Studies: MYCIN, Learning, Rote Learning; Learning by Induction; Explanation based learning.

TEXT/REFERENCES BOOKS:

1. Elaine Rich and Kevin Knight: Artificial Intelligence- Tata McGraw Hill.
2. Dan W.Patterson, Introduction to Artificial Intelligence and Expert Systems- Prentice Hall of India.
3. Nils J.Nilsson: Principles of Artificial Intelligence- Narosa Publishing house.
4. Artificial Intelligence : A Modern Approach, Stuart Rusell, Peter Norvig, Pearson Education
5. Artificial Intelligence, Winston, Patrick, Henry, Pearson Education

Course Outcomes:

EEH452C ELECTRICAL AND HYBRID VEHICLES

(OPEN ELECTIVE-III)

L	T	P	Credits	Class Work	:	25 Marks
3	-	-	3	Examination	:	75 Marks
				Total	:	100 Marks

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

1. Understand the basic concept and history of EV and HEV.
2. Understand the models to describe hybrid vehicles and their performance.
3. Understand the different possible ways of energy storage.
4. Understand the different strategies related to energy management systems.

UNIT I

Introduction: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern electric vehicles on energy supplies. Electric Vehicle Composition and Configurations, Basic concept of hybrid Electric vehicle, HEV configuration types – series, parallel, series-parallel and complex hybrid, Power flow control.

UNIT II

Electric Propulsion: major requirements of EV motor drive, characteristics and control of DC motor, Induction motor, Switched Reluctance motor and Permanent Magnet motor, power converters devices/topology, control hardware, software and strategy vehicle, power source characterization, transmission characteristics.

UNIT III

Energy Storage: Introduction to energy storage requirements in Hybrid and Electric Vehicles, Energy sources, Battery based energy storage and its analysis, Fuel fell based energy storage and its analysis, super capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis.

UNIT IV

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Plug-in electric vehicles, Vehicle to grid (V2G) and Grid to vehicle (G2V) fundamentals

Text / References:

1. **C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.**
2. **S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.**
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, 2004.**
4. **T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.**

NOTE:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students: Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

MGT401C ENTREPRENEURSHIP
(OPEN ELECTIVE-III)

L	T	P	External Marks: 75
3	0	0	Internal Marks: 25
			Total Marks : 100

Duration of Examination: 3 Hours

Course Objective:

The main objective of the course is to expose the students to the growth of entrepreneurship in developing countries and acquaint with the establishment and running of a new enterprise

Unit-I

Entrepreneurship: Concept and Definitions of Entrepreneur & Entrepreneurship; Classification and Types of Entrepreneurs; Traits/Qualities of an Entrepreneurs; Entrepreneurship's Challenges; Factor affecting Entrepreneurial Growth – Economic &Non-Economic Factors; Entrepreneur Vs. Intrapreneur .EDP Programmes.

Unit-II

Innovation Technology Management: Entrepreneurial Opportunity Search and Identification; recognition of a good business opportunity; Conducting Feasibility Studies. Business Plan: Purpose of Business Plan; Contents of Business Plan; Presenting of Business Plan; Why Business plan Fails.

Unit –III

Indian Models in Entrepreneurship: Social Entrepreneur: Introduction; Characteristics, Need, Types and Motivations of Social Entrepreneur. Women Entrepreneurship: Role & Importance, Profile of Women Entrepreneur, Problems of Women Entrepreneurs, Women Entrepreneurship Development in India.

Unit-IV

Developments of Entrepreneur: Micro, Small and Medium Enterprises: Concept & definitions; Role & Importance; MSMED Act 2006, Current Scheme of MSME-Technology Up-gradation Scheme , Marketing Assistance Scheme ,Certification Scheme, Credit- rating scheme , Problems facing MSME.

Financing the venture: Introduction, features and process of Venture Capital, Funding from Banks.

Recommended Books

1. **Roy Rajeev, Entrepreneurship 2/e, Oxford University Press.**
2. **Charantimath, Poornima, "Entrepreneurship Development and Small Business Enterprises", Pearson Education, New Delhi.**

Suggested Readings

1. **Roy Rajeev, Entrepreneurship 2/e, Oxford University Press.**
2. **Charantimath, Poornima, "Entrepreneurship Development and Small Business Enterprises", Pearson Education, New Delhi.**
3. **Norman M. Scarborough, "Essentials of Entrepreneurship & Small Business Management", PHI, New Delhi.**
4. **Vasant Desai, "Entrepreneurial Development and Management", Himalaya Publishing House, New Delhi.**
5. **Kumar Arya, "Entrepreneurship: creating and leading an entrepreneurial organization", Seventh Impression, Pearson Education.**

6. **Holt, "Entrepreneurship: New Venture Creation", Prentice Hall, New Delhi.**
7. **Hisrich, Robert D., Michael Peters and Dean Shephered, "Entrepreneurship", Tata McGraw Hill, New Delhi.**
8. **Bridge, S et al., "Understanding Enterprise: Entrepreneurship and Small Business", Palgrave Publication.**
9. **Donald F. Kuratko, "Entrepreneurship: Theory, Process, and Practice", South Western College Publications.**

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:
   Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Course Outcomes:

At the end of the course:

1. Students will be able to understand the concept of entrepreneurship, traits required to become an entrepreneur.
2. Students will be able to design and formulate the basic principles of business plans, they can choose and present their business plan
3. Students will know about the different types of entrepreneur
4. Students will be aware of the role of MSME in the development of Small Scale industries.

ME452C FUNDAMENTALS OF SUSTAINABLE MANUFACTURING
(OPEN ELECTIVE-III)

L	T	P	Credits	Class Work	:	25 Marks
3	0	--	3	Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Outcomes:

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

5. Summarize sustainability issues and driversof sustainability.
6. Understand various standards for Environmental Impact Assessment.
7. Apply various tools and technique to access manufacturing sustainability.
8. Comprehend sustainability advantages associated with various manufacturing initiatives.

UNIT I

Introduction: Introduction to sustainability and drivers for sustainable development and sustainable Sustainable Manufacturing - Concept of Triple bottom line, Environmental, Economic and Social Dimensions of Sustainability, Sustainable Product Development – Various Phases.

UNIT II

Tools and Techniques: Environmental Conscious Quality Function Deployment, Life cycle assessment, Design for Environment, R3 and R6 cycles, loop production systems, Reverse supply chain, product acquisition management Design for Disassembly.

UNIT III

EIA Standards: CML, EI 95 and 99, ISO 14001 EMS and PAS 2050 standards, Environmental Impact parameters Energy in manufacturing (assessment and minimization)the

Design for recycling: Eco friendly product design methods – Methods to infuse sustainability in early product design phases

UNIT IV

Sustainability Assessment: Concept, Models and Various Approaches, Toxic substances in industry, Product Sustainability and Risk/Benefit assessment– Corporate Social Responsibility, Industry cooperation for reducing Carbon footprint

Green Manufacturing: Dry and near-dry machining, edible oil-based cutting fluids, cryogenic machining, improving work environment, of lean manufacturing, Lean techniques for green manufacturing and strategies for waste reduction in green manufacturing.

Textbooks:

1. **G. Atkinson, S. Dietz, E. Neumayer —Handbook of Sustainable Manufacturing‖. Edward Elgar Publishing Limited, 2007.**
2. **D. Rodick, Industrial Development for the 21st Century: Sustainable Development Perspectives, UN New York, 2007.**

Reference Books

1. **P. Lawn, Sustainable Development Indicators in Ecological Economics, Edward Elgar Publishing Limited.**

3. **S. Asefa, The Economics of Sustainable Development, W.E. Upjohn Institute for Employment Research, 2005.**

Notes:

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

CHE459C : NANOSCIENCE AND NANOTECHNOLOGY
(OPEN ELECTIVE-III)

L	T	P	Credits			
3	0	--	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Objectives:

1. To initiate the student in the area of development of new materials / nanomaterials for novel applications and devices.
2. To impart foundational knowledge of nanoscience and related fields.
3. To make the students acquire an understanding of the analytical techniques in nanoscience and nanotechnology fields.
4. To help them understand in broad application areas of nanoscienceand nanotechnology in engineering.

UNIT-I

Types of materials; bonding in materials; crystal structures and defects; amorphous materials; origins of properties of materials; Effect of nanostructures on properties of materials.

The science of materials – materials science; Historical use of nanoparticles; discovery of the carbon nanotubes; fullerenes; nanostructured materials

UNIT-II

Particle-wave duality; de-Broglie waves; Schrodinger equation in 1-Dimension; Superposition; Energy eigenstates; Interpretation of wave function; Fermions and Bosons; Electron density of states; Energy bandgaps; Fermi energy; Excitons and Bohr radius.

UNIT-III

AFM; STM; Transport in nanostructures; 0,1 and 2 dimensional nanostructures; Bandgap engineering; Molecular motors; MEMS and NEMS devices. Biomaterials and nano-biotechnology.

UNIT-IV

Synthesis of Nanomaterials – ZnO and Fe_3O_4. Characterization of phases and quantification of phases. Applications of Nanomaterials: In textile industry, in catalytic operations, in energy generation, in energy storage, in environmental remediation and in sensors and devices.

TEXT BOOKS:

1. **NANO:The Essentials Understanding Nanoscience and Nanotechnology, T. Pradeep, Tata McGraw Hill Publishing Company Limited, 2007, 0-07-154830-0.**
2. **Material Science and Engineering, 7thed. , William D. Callister, Johan Wiley & Sons, Inc.**
3. **Nanostructured Materials and Nanotechnology, Hari Singh Nalwa, Academic Press, 2002.**
4. **Nanostructures and Nanomaterials, synthesis, properties and applications., Guozhong Cao, Imperial College Press, 2004.**

REFERENCE BOOKS:

1. **Introduction to Nanoscience, S.M. Lindsay, Oxford University Press, 2010, ISBN: 978–019–954421–9 (Pbk).**
2. **Nanoscience, Hans-Eckhardt Schaefer, Springer, 2010, ISBN 978-3-642-10558-6.**

3. **Chemistry of nanomaterials: Synthesis, Properties and applications. C.N.R. Rao, Achim Muller, A.K. Cheetham, Wiley-VCH, 2004.**

NOTES:

1. Part A: Till academic session 2020-2021:In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting at least one question from each unit.

   Part B: From Academic Session 2021-2022 onwards: For the semester examination, nine questions are to be set by the examiner. Question no. 1, containing 6-7 short answer type questions, will be compulsory & based on the entire syllabus. Rests of the eight questions are to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit. All questions will carry equal marks.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:

Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Course Outcomes:

After completing this course, students will be able to:

1. Learn about the background on nanoscience and give a general introduction to different classes of nanomaterials.
2. Develop an understanding of the science behind the nanomaterial properties.
3. Apply their learned knowledge to study and characterize nanomaterials.
4. Familiarize themselves with the variety of nanotechnology applications, and know how to approach the synthesis of nanomaterials with a set of desirable properties.

EE454C SMART GRID
(OPEN ELECTIVE-III)

L	T	P	Credits			
3	0	--	3	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

UNIT-I

Introduction: Concept of smart grid, smart grid control, Communications and Sensing in a Smart Grid, Hardware Architecture, Software architecture, Protocol detail, application & benefits, PLCs Vs RTUs, IED's, RTU Block diagram, PMU communication interface.

UNIT-II

Cyber Security of the Smart Grid: Smart Grid Threats, Vulnerabilities and Cyber Security Strategies, Cyber Security Environment, False Data Injection and Attacks in Electric Power Grids Cyber-Physical System Security.

UNIT-III

Smart Grid Technologies: Energy Management System, Demand side management: peak clipping, valley filling, load shifting etc., state estimation, load forecasting. Time of the day pricing(TOD), Time of use pricing(TOU).

UNIT-IV

Distributed Generation & Control: Concept of distributed generation, Introduction of various distributed generation sources like wind, solar, fuel-cell, micro-hydro, PHEV's etc., Grid integration and control of distributed generation sources.

TEXT BOOKS:

1. T. Gönen, Electric Power Distribution System Engineering, McGraw-Hill, 1986. ISBN: 0- 8493- 5806-X.

2. Distribution System Protection Manual, McGraw-Edison Power Systems, 1990.

3. Westinghouse Electric Utility Ref. Book, Vol.3, Distribution Systems, 1965.

4. R. E. Brown, Electric Power Distribution Reliability, Marcel Dekker Inc., 2002

REFERENCE BOOKS:

1. IEEE Power and Energy Magazine, July/August 2007 Issue

2. James Burke, Power Distribution Engineering, Mercel Dekker, 1994.

3. A.J. Pansini, Electrical Distribution Engineering McGrawHill, 1983.

4. E. Lakervi, E.J.Holmes, Electricity Distribution Network Design, IEE series, 1989.

5. J. Gers and E. J. Holmes Protection of Electricity Distribution Networks 2nd Edition.

NOTE:

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.

3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students: Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.

Course Outcomes:

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

1. Understand the features of Smart Grid.
2. Understand to make conventional grid more smart, reliable, and efficient.
3. Understand the technical expertise in the emerging area of smart grid.
4. Understand the concepts of distributed generation.

EE484C PROJECT STAGE-II

B. Tech. Semester – VIII (Electrical Engg.)

L	T	P	Credits			
-	-	16	8	Class Work	:	25 Marks
				Examination	:	75Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

Course Objectives:

1. To align student's skill and interests with a realistic problem or project
2. To understand the significance of problem and its scope.
3. Students will make decisions within a framework

Project involving design/ fabrication/ testing/ computer simulation/ case studies etc. will be evaluated through a panel of examiners consisting of the following:

Chairman of Department Chairperson
Project coordinator Member Secretary
Respective project supervisor Member

The student will be required to submit two copies of his/her project report to the department for record (one copy each for the department and participating teacher).

Project coordinator will be assigned the project load of maximum of 2 hrs. per week including his own guiding load of one hr. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her. Internal evaluation will be carried out four times in a semester.

The format of the cover page and the organization of the body of the report for all the B.Tech. will be finalized and circulated by the Dean, Faculty of Engineering and Technology.

Course Outcomes:

After completing the course the students will be able to:

1. Develop the professional quality of employing technical knowledge obtained in the field of Engineering & Technology.
2. Design and make analysis augmented with creativity, innovation and ingenuity.
3. Develop an understanding on how to work in actual industry environment.
4. Utilise the technical resources and write the technical report.

EE482C General Fitness for the Profession

B. Tech. Semester – VIII (Electrical Engg.)

L	T	P	Credits	Class Work	:	100 Marks
-	-	2	1	Examination	:	-
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

The purpose of this course is to inculcate a sense of professionalism in a student along with personality development in terms of quality such as receiving, responding, temperament, attitude and outlook. The student efforts will be evaluated on the basis of his/ her performance / achievements in different walks of life.

Evaluation of the General Fitness

The evaluation of the General Fitness will be made by the committee of examiners constituted as under:

1. Chairperson of the Department : Chairperson
2. Final Year Coordinator of the Department : Member
3. External Examiner : Appointed by the University

EE490C Internship

B. Tech. Semester – VIII (Electrical Engg.)

L	T	P	Credits			
-	-	28	20	Class Work	:	250 Marks
				Examination	:	250 Marks
				Total	:	500 Marks
				Duration of Examination	:	3 Hours

Guidelines for Internship

A student can opt for Internship (minimum 16 weeks) in 8th semester, in lieu of course work of 8th semester, in joint supervision of internal supervisor (allotted by the Department) and the supervisor/official of the organization under whom the candidate is associated for internship.A student can arrange the internship at his/her own and arranging internship for a student by the Department is never his/her right.

Pre-requisite conditions:

a) The student has got selected through on-campus/off-campus placement and the same employer is willing to take that student for the Internship.

b) The student has got offer of pursuing Internship from Government research organization/govt. sponsored projects IIT'S/IIIT'S/IIMs/CDAC.

c) The student has got offer of pursuing Internship from reputed private organization.

For pursuing Internship, student will require the prior approval of the Director/Principal of the institute or Chairperson of the University Department. While allowing Internship, the institute/department concerned must insure that the proposed Internship schedule does not disturb the academic calendar in force.The candidate should submit a synopsis of the proposed work to be done during Internship. This synopsis should be submitted to the Department before the start of the internship semester. The synopsis received will be examined/evaluated by the Departmental committee. The student will be allowed for internship only after approval of synopsis by the Departmental committee.

Intimation of commencement of internship shall be submitted to the Chairperson concerned before the commencement of the ongoing semester.

They will have to further deposit the 8th Semester fee. The internship will not be permitted through online mode

If a student feels that the internship work is not of high quality/not-related to their field of interest, then he/ she should submit the application to the Department within two weeks and can re-join the institute to carry out the course work of 8th Semester.

The internal supervisor will monitor the student specific progress of the internship. The overall monitoring of industrial training has to be done by a Departmental Faculty Co-coordinator for Internship.

The Departmental Faculty Co-coordinator will be allotted total weekly teaching load of 2 periods, while each internal supervisor will be allotted total weekly teaching load of 1 period (supervising upto 4 students), and 2 periods , if supervising more than 4 students.

Evaluation Process:

Each student will submit 3 copies of the detailed internship report to the Department in prescribed format at the conclusion of training.

Internal assessment/Sessional of Internship will be made jointly by the Departmental Faculty Co-coordinator for Internship, the concerned organization training supervisor/official and internal supervisor.

Assessment by the External supervisor/Mentor = 40% of Internal Assessment Marks

Assessment by the internal supervisor and Departmental Faculty Co-coordinator for Internship = 60% of Internal Assessment Marks

Practical Examination Assessment of Internship will be made by the committee consisting of the Chairperson of the Department, Departmental Faculty Co-coordinator for Internship and one external examiner appointed by the University.