Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

DIT UNIVERSITY
Dehradun

Detailed Course Structure & Syllabus of B.Tech – Electrical Engineering

Approved by the Academic Council at its 6th Meeting held on 13.05.2017

Course Structure & Syllabus of B.Tech – Electrical Engineering
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Year: 1st **Semester: I**

Course Category	Course Code	Course Title	L	T	P	Credit
UC	MA101	Engineering Mathematics-I	3	1	0	3.5
UC	PY101	Engineering Physics	3	1	2	4.5
UC	HS101	Professional Communication	2	1	1	3
UC	CS101	Computer Fundamental & C Programming	3	0	2	4
UC	ME104	Workshop Practice	0	0	2	1
UC	EE101	Introduction to Electrical and Electronics Engineering	3	1	2	4.5
UC	EE102	Electrical & Electronics Measurements	1	0	2	2
		Total				**22.5**

Year: 1st **Semester: II**

Course Category	Course Code	Course Title	L	T	P	Credit
UC	MA102	Engineering Mathematics-II	3	1	0	3.5
UC	HS102	Corporate Communication and Soft Skills	2	1	1	3
UC	CS102	Computer Programming in C++	3	0	2	4
UC	ME101	Engineering Mechanics	3	1	0	3.5
UC	ME102	Mechanical Measurements	1	0	2	2
UC	ME103	Engineering Graphics	0	0	3	1.5
UC	CH101	Engineering Chemistry	3	1	2	4.5
		Total				**22**

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Year: 2nd **Semester: III**

Course Category	Course Code	Course Title	L	T	P	Credit
AC	CH201/ HS244	Environmental Science/ Indian Constitution	2	0	0	0
SC	MA201	Mathematics - III	3	1	0	4
DC	EE201	Basic Network Analysis	3	1	2	5
	EE202	Electromechanical Energy Conversion - I	3	1	2	5
	EE203	Measurements & Instrumentation	3	0	2	4
	EC211	Analog & Digital Electronics	3	0	2	4
Total						**22**

Year: 2nd **Semester: IV**

Course Category	Course Code	Course Title	L	T	P	Credit
HE		Humanities Elective - 1	2	0	0	2
AC	CH201/ HS244	Environmental Science/ Indian Constitution	0	0	0	0
DC	EE204	Electrical Power Generation	3	0	0	3
	EE205	Electromechanical Energy Conversion - II	3	1	2	5
	EE206	Engineering Materials	3	0	0	3
	EE207	Microprocessors	3	0	2	4
	EE208	Network Analysis & Synthesis	3	1	2	5
AC	EE230	Value Added Training	0	0	2	0
Total						**22**

Humanities Elective 1

Course Code	Course Title
HS241	Education and Social Change
HS242	Introduction to Psychology
HS243	Science, Technology and Society
HS245	Ethics and Self-Awareness

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Year: 3rd **Semester: V**

Course Category	Course Code	Course Title	L	T	P	Credit
DC	EE301	Control System	3	0	2	4
	EE302	Elements of Power System	3	0	2	4
	EC204	Electromagnetic Field Theory	3	1	0	4
DE		Department Elective - 1				4
		Department Elective - 2				4
PRJT	EE330	Study Project	0	0	4	2
ST	EE331	Summer Training Evaluation	0	0	2	0
HE		Humanities Elective - 2	2	0	0	2
AC	HS301	Aptitude & Soft Skills- 3	3	0	0	0
Total						**24**

Department Elective 1

Course Code	Course Title	L	T	P
EE344	Utilization of Electrical Energy & Traction	3	1	0
CS211	Discrete Mathematics	3	1	0
EE342	Telemetry & Data Transmission	3	0	2
EE343	Dynamic System Analysis	3	0	2
EE345	Modern Control System	3	0	2

Department Elective 2

Course Code	Course Title	L	T	P
EE347	High Voltage Engineering	3	1	0
EE346	Wind and Solar Energy Systems	3	0	2
EC341	Transducers and Instrumentation	3	0	2
CS201	Data Structure	3	0	2
CS202	Java Programming Concepts	3	0	2
CS204	Database Management System	3	0	2
CS301	Algorithms: Analysis & Design	3	0	2
CS343	Advanced Concepts in OOPs	3	0	2
CS344	Introduction to Cloud Technologies	3	0	2

Humanities Elective 2

Course Code	Course Title
HS384	Principles of Management
HS385	Engineering Economics
HS391	Positive Psychology & Living
HS382	Literature, Language and Society

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Year: 3rd **Semester: VI**

Course Category	Course Code	Course Title	L	T	P	Credit
DC	EE303	Power Electronics	3	0	2	4
	EE304	Power System Analysis	3	0	2	4
DE		Department Elective - 3				4
		Department Elective - 4				4
		Department Elective - 5				4
OE		Open Elective-1	3	0	0	3
PRJT	EE332	LAB/Design Project - I	0	0	10	5
AC	EE333	Industrial Tour	0	0	2	0
AC	HS304	Aptitude & Soft Skills- 4	3	0	0	0
Total						**28**

Department Elective 3

Course Code	Course Title	L	T	P
EE349	Non-Conventional Energy Resources	3	1	0
EE350	Special Electrical Machine	3	1	0
CS346	Introduction to Big Data Analytics	3	0	2

Department Elective 4

Course Code	Course Title	L	T	P
EE351	Industrial Electrical Systems	3	1	0
EE352	Digital Control Systems	3	0	2
EE354	Digital Simulation of Power System	3	0	2

Department Elective 5

Course Code	Course Title	L	T	P
EE353	Power Station Practice	3	1	0
CS214	Operating Systems	3	1	0
EE348	Electrical Machine Design	3	0	2
EC352	Biomedical Instrumentation	3	0	2
CS205	Dot Net Technologies	3	0	2
IT346	Advanced Web Technology	3	0	2

Open Elective 1

Course Code	Course Title	L	T	P
AR384	Green Building	3	0	0
CE381	Disaster Preparedness, Planning and Management	3	0	0
CS351	Software Engineering	3	0	0

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Year: 4th **Semester: VII**

Course Category	Course Code	Course Title	L	T	P	Credit
DC	EE401	Switchgear & Protection	3	0	2	4
	EE402	ANN & Fuzzy Logic	3	0	2	4
	EE403	MATLAB for Engineers	1	0	4	3
DE		Department Elective - 6				4
OE		Open Elective-2	3	0	0	3
PRJT	EE430	LAB/Design Project - II	0	0	16	8
UC	ME381	Entrepreneurship & Start Up	2	0	2	3
AC	HS311	Employment Enhancement Program	2	0	0	0
Total						**29**

Department Elective 6

Course Code	Course Title	L	T	P
EE441	Power Quality	3	1	0
EE442	Optimization Techniques	3	0	2
EE443	Electric Drives	3	0	2
EC353	Microcontroller	3	0	2
CS302	Artificial Intelligence	3	0	2
CS442	Cryptography and Network Security	3	0	2
IT441	Deep Learning	3	0	2

Open Elective 2

Course Code	Course Title	L	T	P
CS481	Software Quality Engineering	3	0	0
IT353	Basics of Data Science	3	0	0
IT356	Multimedia	3	0	0
EC383	Consumer Electronics	3	0	0
EC385	Analog Electronics	3	0	0
ME342	Composites Materials	3	0	0
ME445	Total Quality Management	3	0	0
PE481	Fuel Technology	3	0	0
PE482	Health Safety and Environment in Industry	3	0	0
MA451	Statistical Techniques & their application	3	0	0
AR481	Graphics & Product Design	3	0	0
CS481	Software Quality Engineering	3	0	0

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Year: 4th **Semester: VIII**

Course Category	Course Code	Course Title	L	T	P	Credit
IP/THESIS	EE409	Industrial Project/Thesis	0	0	32	16
		or				
HE		Humanities Elective - 3	2	0	0	2
DE		Department Elective - 7				4
		Department Elective - 8				3
		Department Elective - 9				3
		Department Elective - 10				3
OE		Open Elective-3	3	0	0	3
Total						**18**

Department Elective 7

Course Code	Course Title	L	T	P
EE447	Power System Operation & Control	3	1	0
EE449	EHV AC & DC Transmission	3	1	0
EE448	Power Semiconductor Controllers	3	0	2
EE451	Energy Management System	3	0	2

Department Elective 8

Course Code	Course Title	L	T	P
EE452	Electrical Energy Conservation and Auditing	3	0	0
EE444	Computer Methods in Power System Analysis	2	0	2

Department Elective 9

Course Code	Course Title	L	T	P
EE445	Power System Deregulation	3	0	0
EC473	Automotive Electronics	3	0	0
EE450	Line Commutated and Active PWM Rectifier	3	0	0

Department Elective 10

Course Code	Course Title	L	T	P
EE446	Reliability Engineering	3	0	0
EE444	Computer Methods in Power System Analysis	2	0	2
CS471	Data Base Administration	2	0	2
CS472	Information Security	2	0	2

Humanities Elective 3

Course Code	Course Title
HS493	Indian Culture & Tradition
HS483	Indian Philosophy
HS491	Industrial Sociology
HS485	Sustainable Development

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Open Elective 3

Course Code	Course Title	L	T	P
CS482	Human Computer Interaction	3	0	0
IT357	Internet of Things	3	0	0
IT359	Mobile Computing and Services	3	0	0
EC386	Fundamental of communication & Networks	3	0	0
EC382	Biomedical Instrumentation	3	0	0
ME382	Ergonomics and Value Engineering	3	0	0
ME366	Product Design and Development	3	0	0
ME452	Renewable Energy Sources	3	0	0
CE483	GIS	3	0	0
PE491	Carbon Capture and Sequestration Technology	3	0	0
MA452	Optimization Techniques	3	0	0
AR485	Art Appreciation	3	0	0
PY481	Nano scale science and technology	3	0	0

Summary of the Credit

Year	Semester	Credit
1	1	22
	2	22.5
2	3	22
	4	22
3	5	24
	6	28
4	7	29
	8	16 / 18
Total		185.5 / 187.5

Category wise classification of the Credit

Category	Credits	No. of Subjects
AC	0	7
DC	69	17
DE	37	10
HE	6	3
IP/THESIS	16	1
OE	9	3
PRJT	15	3
SC	4	1
ST	0	1
UC	47.5	15
Grand Total	185.5 / 187.5	61

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Subject Code	MA101	Subject Title	Engineering Mathematics-I						
LTP	3-1-0	Credit	3.5	Subject Category	UC	Year	1st	Semester	I/II

OBJECTIVE: To introduce the fundamentals in Differential, Integral and Vector Calculus relevant to engineering applications.

Unit I : Differential Calculus I

Functions of one variable, Definitions of Limit, Continuity and Differentiation. Basic Theorems for each of these concepts, Successive Differentiation, Leibnitz Theorem, Taylor's Theorem with remainder, Rolle's Theorem, Mean Value Theorem and their applications. Critical points, Local Maxima & Minima, Increasing & Decreasing, Concavity , Points of inflection, Asymptotes of functions and their use in drawing neat sketch of its graph.

Unit II: Differential Calculus II

Functions of two or more variables, concept of Limit and Continuity, .Partial Differentiation, Euler's theorem for Homogeneous functions, Chain rule, Total differential, Local Maxima, minima, Lagrange's Multiplier method, Taylor Series.

Unit III: Integral Calculus

Indefinite integrals, Fundamental theorem of Integral Calculus. Definite integral and its applications. Improper Integrals, Gamma and Beta functions, Double & Triple integration, Change of order of integration, Change of Variables. Dirichlet's Integral. Applications of multiple integrals.

Unit IV Vector Calculus

Scalar & Vector functions, Scalar & Vector fields, Gradient of a scalar function and its applications, Directional derivative. Divergence & Curl of a Vector function and their applications. Line integral, Surface integral. Statements of Green's Theorem, Stokes Theorem and Divergence Theorem and their applications

LEARNING OUTCOME: Familiarity with fundamental tools of Differential, Integral and Vector Calculus relevant to engineering applications

Text Books:

1. G. B. Thomas Jr. & R. L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson Education

Reference Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, U.K., 2006.
2. R. K. Jain and S.R.K. Iyenger, Advanced Engineering Mathematics, 2nd edition, Narosa Publishing House, New Delhi, India,2006

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	PY101	Subject Title	Engineering Physics						
LTP	3-1-2	Credit	4.5	Subject Category	UC	Year	1st	Semester	I/II

OBJECTIVES

- The student will acquire a strong background in Applied Physics that will serve as a basis for engineering problem solving.
- The student will learn the basic concepts found in Oscillations and Waves, Optics, Quantum Mechanics, Nanotechnology and Lasers.
- The students will acquire problem-solving and analytical skills that will help in preparation for areas of engineering chosen.
- The students will learn how to demonstrate the application of the scientific methods though laboratory experiments thereby verifying the concepts related to theory content knowledge.
- The students will learn to demonstrate the ability to communicate scientific information effectively in written and oral formats.

UNIT I:

Oscillations and Waves: Oscillations, Simple Harmonic Motion: Equation of Simple Harmonic Motion, Characteristics of SHM, Energy, Free Oscillations, Damped Oscillations, Forced Oscillations, Resonance, Coupled Oscillations, Waves: Travelling waves, wave equation, types of waves, Reflections and Transmission of Waves at a boundary. **(6) L**

UNIT II:

Interference: Fringes with white light, Interference in plane parallel thin film (reflected and transmitted case), Wedge shape film (reflected case), Newton's Rings and its application to determine wavelength of monochromatic light and refractive index of a liquid. **Diffraction:** Difference between Interference and Diffraction, Fraunhofer diffraction due to a single slit: resultant intensity, conditions of maxima and minima, angular and linear width of central maximum, N slit diffraction: resultant intensity, conditions of maxima and minima, missing orders, angular width of principal maxima. **(10) L**

UNIT III:

Polarization: Polarized and unpolarized light and its pictorial representation, plane of polarization and plane of vibration, Phenomenon of Double Refraction, positive and negative double refracting crystals, properties of ordinary and extra-ordinary rays, Nicol Prism and its applications as a polarizer and analyzer, Mathematical analysis of superposition of two linearly polarized light vectors, retardation plates-half and quarter wave plates, Production and detection of Plane, Circularly and Elliptically Polarized light. **(8) L**

UNIT IV:

Quantum Mechanics: Concept of wave packet, group and phase velocity, Heisenberg Uncertainty Principle and its applications viz. non-existence of electron in nucleus, radius and energy of Bohr's first orbit, Schrödinger time independent and time dependent wave equation, Physical interpretation of wave function, normalization condition of the wave function, Application of Schrodinger wave equation: Particle in a one dimensional box (eigen function and eigen values) and rectangular potential barrier. **(8) L**

UNIT V:

Nanotechnology: Introduction to Nanomaterial, Classification of nanomaterials, application of nanotechnology. **Lasers:** Spontaneous and Stimulated emission, Stimulated Absorption, Einstein's A & B Coefficient, metastable states, population inversion, basic principle of laser (three level and four level), optical cavity and resonator, He-Ne laser. **(8) L**

List of Experiments

1. **To determine the wavelength of monochromatic light by Newton's Ring.**
2. **To determine the specific rotation of cane sugar solution using bi-quartz polarimeter.**
3. **To determine the wavelength of spectral lines using plane transmission grating.**
4. **To study the variation of magnetic field along the axis of a current carrying coil and then to estimate the radius of coil.**
5. **To Study the nature of polarization of Laser light and verify Malus Law**
6. **To Measure the acceleration due to gravity 'Value of g' using bar pendulum**
7. **To measure the frequency of ac mains using sonometer.**
8. **To measure the numerical aperture (NA) of an optical fibre.**
9. **Measurement of thickness of wire using LASER beam.**
10. **To study the characteristics of a Photovoltaic cell.**

LEARNING OUTCOMES:

- Demonstrate a detailed knowledge of Oscillations, Optics, Quantum Mechanics, Lasers and Nanotechnology.
- Discuss how laws of Physics can be applied in the understanding and development of engineering systems.
- An ability to communicate scientific information effectively in written and oral formats.
- Skills to perform experiments in the physics laboratory with ability to work independently and an ability to analyze and interpret data in the physics laboratory.

Text Books:

- Ajoy Ghatak; Optics; Tata Mc-Graw Hill Education, 2009.
- Arthur Beiser; Concepts of Modern Physics; Tata Mc-Graw Hill Education, 2003

Reference Books:

- Jenkins and White; Fundamentals of Optics; Fourth; McGraw-Hill, 2000
- Young and Freedman; Sears and Zemansky's University Physics, Tenth; Addison-Wesley, 2000.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	HS101	Subject Title	Professional Communication						
LTP	2-1-1	Credit	3.0	Subject Category	UC	Year	1st	Semester	I/II

OBJECTIVES

- To promote efficiency in English Language with the development of the four skills of communication i.e., LSRW (Listening, Speaking, Reading & Writing).
- To help students perform better in all academic subjects through greater command over the English language.
- To develop technical writing skills with a focus on critical thinking, rhetorical analysis, effective writing & effective document design.

Unit-I

Communication 6 hrs

Communication: Meaning, Types of Communication: General & Technical Communication
Barriers to Communication, Overcoming strategies.

Unit II

Non Verbal Communication 3 hrs

Knowledge and adoption of Non Verbal cues of communication: Kinesics, Proxemics, Chronemics, Oculesics, Haptics, Paralinguistics

Unit III

Listening & Speaking Skills 6 hrs

Listening Comprehension: identifying General & Specific information, Note taking and drawing inferences
Introduction to Phonetics : Articulation of consonants and vowel sounds.
Public Speaking
Discussion Techniques

Unit IV

Reading Skills 4 hrs

Reading Strategies and Vocabulary Building
Reading Comprehension

Unit V

Technical Writing Skills 7 hrs

Paragraph development
Technical Articles, Research Articles, Plagiarism
Intra office Correspondence: Notice, Agenda, Minutes and Memorandum,
Technical Proposal & Report

LEARNING OUTCOMES

- Build confidents of the students through practice of the basic skills of the basic skills of communication.
- The students will be equipped to comprehend a variety of content & develop deeper insight.
- Enable the students to effectively create standard formats used to construct meaningful documents.

TEXT BOOKS

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005.
2. Lata, Pushp and Sanjay Kumar, Communication Skills, Oxford University Press, New Delhi. 2011.

REFERENCE BOOKS

1. Aslam, Mohammad. Introduction to English Phonetics and Phonology Cambridge.2003.
2. Ford A, Ruther. Basic Communication Skills; Pearson Education, New Delhi.2013.
3. Gupta, Ruby. Basic Technical Communication, Cambridge University Press, New Delhi.2012.
4. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010.
5. Tyagi, Kavita & Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011.

Course Structure & Syllabus of B.Tech – Electrical Engineering

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Subject Code	CS101	Subject Title	Computer Fundamental & C Programming						
LTP	3-0-2	Credit	4.0	Subject Category	UC	Year	1st	Semester	I/II

OBJECTIVES

The objective of the course is to make the students to understand the key hardware components in a modern computer system and as to how the software is mapped to the hardware. The student shall also be able to learn make the computer programs using C language by exploring the various features of C.

Unit-1 **8L**

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services &types.

Number System: Binary, octal and hexadecimal number systems, their mutual conversions, **Binary arithmetic**.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, **Types of computer languages:- Machine Language, Assembly Language and High Level Language,** Concept of Assembler, Compiler, Loader and Linker.

Unit-2 **8L**

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O

Unit-3 **8L**

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break, continue and goto statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit -4 **8L**

Arrays: Array notation and representation, manipulating array elements using one and two dimensional arrays, linear searching, sorting (bubble sort), strings, matrix manipulation (transpose, addition, multiplication).

Structures: Purpose and uses of structures, declaring structures, array of structures, union, enumerated data types

Unit -5 **8L**

Pointers: Pointers: pointer variables, pointer operator, pointer expression, array of pointers, multiple indirection, pointers to functions, dynamic memory allocation functions.

File handling, standard C preprocessors, defining and calling macros, conditional compilation.

LEARNING OUTCOMES

At the end of the course the students shall be able to:

- The basics of computer components & computer software.
- The basic terminology used in computer programming.
- To write, compile and debug programs in C language.
- Use different data types in a computer program.
- To design programs involving decision structures, loops and functions.
- To explain the difference between call by value and call by reference
- The dynamics of memory by the use of pointer.
- To use & understanding of file handling

Text Books:

1. Yashwant Kanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
2. Stephen Prata "C Primer Plus" Addison-Wesley/Pearson 6th Edition 2014
3. P.K. Sinha "Computer Fundamentals" B.P.B Publication.

Reference Books:

1. Kernighan & Ritchie, "C Programming Language", (Ansi C Version), PHI, 2nd Edition.
2. Byron Gottfreid "Schaum's Outline of Programming with C".

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Subject Code	ME104	Subject Title	Workshop Practice						
LTP	0-0-2	Credit	1.0	Subject Category	UC	Year	1st	Semester	I/II

Course Objective:

To identify hand tools and instruments for machining and other workshop practices. To obtain basic skills in the trades of fitting, carpentry, welding, sheet metal and machining. Introduction to Foundry, Forging shop, Gas & Spot Welding Acquire measuring skills, using standard workshop instruments & tools.

List of Experiments

1. **Carpentry**: To make a wooden joint with soft wood as per the drawing provided in the manual. (One of the following jobs)
   Jobs: T-Lap joint, Dove tail joint, Mortise & Tendon joint, bridle joint. (4 Hrs)
2. **Arc Welding**: To make a welding joint with mild steel flat using Manual Metal Arc Welding Machine according to the drawing provided in the manual. (One of the following jobs)
   Jobs: Lap joint, Butt joint, Fillet/Corner joint. (4 Hrs)
3. **Fitting**: To make a joint using fitting tools with mild steel flats, round bars or square bars as per the drawing provided in the manual. (One of the following jobs)
   Jobs: Plug and socket joint with MS Plate, Square key with MS bar, External threads on GI pipes, Internal threading on MS flats. (4 Hrs)
4. **Machining**: To make a machine- component using lathe with mild steel round bar or hexagonal bar comprising common turning operations with reference to the drawing given in the manual. (One of the following jobs)
   Jobs: Hex Bolt, Axle for cycle wheel, Jig Bush, a typical turning specimen. (4 Hrs)
5. **Sheet metal**: To make a sheet metal component with galvanized iron sheet as per the drawing provided in the manual having spot welded joint. (One of the following jobs)
   Jobs: Square tray, Scoop, Funnel. (4 Hrs)
6. **Foundry & Forging shop**: To observe the demonstration of making a square key using hand forging tools & study the concept and application of Foundry. (2 Hrs)
7. **Gas & Spot Welding**: To observe the demonstration of making a Lap joint/Butt joint with mild steel sheet using Oxyacetylene flame as per the drawing provided in the manual & to perform the spot welding operation on G.I. sheet. (2 Hrs)
8. **Minor Project:** To make a minor project by the students in batches. (2 Hrs**)**

Learning Outcomes:

- Capability to identify hand tools and instruments for machining and other workshop practices.
- Obtain basic skills in the trades of fitting, carpentry, welding and machining.
- Acquire measuring skills, using standard workshop instruments & tools.
- Gain eye hand coordination, enhance psycho motor skills and attitude.

Text Book:

1. H. Chaudhary, "Elements of Workshop Technology Volume 1 & 2", Media promoters & Publishers Pvt. Ltd. 14ed. (2017)

Reference Books:

1. B.S. Raghuwanshi, "A course in Workshop technology Volume 1 & 2", Dhanpat Rai & Co, 10th ed
2. W.A.J. Chapman, "Workshop Technology Part 1, Part 2 & Part 3", CBS Publishers & Distributers Pvt. Ltd.

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Subject Code	EE101	Subject Title	Introduction to Electrical and Electronics Engineering						
LTP	3-1-2	Credit	4.5	Subject Category	UC	Year	1st	Semester	I/II

OBJECTIVES

- To acknowledge students about charge, current, voltage and various circuit laws involved in analysis.
- To get acquaints students with the basic idea of Generation, Transmission and Distribution of Electrical energy.
- To provide students with the basic knowledge of operation and working different types of electrical machines and their application
- To provides knowledge regarding use of multiphase system and their possible interconnections with different loads.

To get acquaints student with fundamental knowledge of semiconductor devices their characteristics and modelling in different applications.

UNIT I – DC NETWORK THEOREM

Review of basic circuit theory concepts, Mesh and Nodal analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star – Delta transformation

UNIT II – AC CIRCUIT'S FUNDAMENTAL AND TRANSFORMERS

Single Phase AC: Phasor representation of voltage and current, AC circuit behaviour of Resistive, Inductive and Capacitive Load and their combination in series and parallel, Power triangle, Power factor

Three Phase AC: Delta and Star connections, Relation between Line and Phase values, three phase power and its measurement

Transformers: Principle of power Generation (single line diagram), Principle of Operation, Types of construction

UNIT III – ELECTRICAL MACHINES

DC Machines: Construction, working principle & characteristics

Three Phase Induction Machines: Principle of operation of 3 ϕ Induction Motor, Types of Induction Motor, need for starter in 3 ϕ IM, Slip- Torque characteristics.

Single Phase Induction Motor: Principle of operation of 1 ϕ IM, Methods of starting of 1 ϕ IM

Synchronous Machines: Construction and Principle of operation of Alternator and Synchronous Motor

UNIT IV: FUNDAMENTAL OF SEMICONDUCTOR: Energy bands in semiconductors, intrinsic and extrinsic semiconductors, Fermi level.

Diode circuits: Construction, Junction diode characteristics, Half and full wave rectifiers - Expression for efficiency and ripple factor , Filter circuits. Zener Diode Characteristics and its application as voltage regulator in Regulated power supply.

UNIT V: TRANSISTOR FUNDAMENTAL:

Transistor circuits: Construction and characteristics of a transistor in CB, CE and CC modes - Relative merits. Load Line and operating point concept (both AC and DC). Biasing of Transistors and stability analysis. Construction and characteristics of JFET and MOSFET.

Communication Systems, Communication Channels, Need of modulation, Types of modulations (Wave shapes and final expression only),

Text Books

1. Vincent Del Toro, "Principles of Electrical Engineering", Prentice Hall Publication.
2. I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill Publication.
3. Electronics Devices and Circuits, Millman and Halkias, Tata McGraw Hill, 4t h ed.

4. Electronic Communication Systems, John Kennedy , Tata McGraw Hill, 4th ed.

Electrical and Electronics Lab:

1. Verification of Network Theorems.
2. Measurement of efficiency of a single phase transformer by load test.
3. Determination of parameters and losses in a single phase transformer by OC and SC test.
4. Perform the polarity test on Transformer.
5. Study of characteristic of AC Motor.
6. Study of DC shunt and series generator characteristics.
7. Study the Speed control of dc shunt motor.
8. Study running and reversing of a three phase induction motor.
9. To identify and Study of the various component and Devices of electronics with their specification (CRO, Function Generator, Multimeter, Power Supply, resistor, capacitor, inductor, ICs, LED, potentiometer etc.)
10. To study the V-I characteristics of PN diode and Zener diode.
11. To find the efficiency of rectifiers and ripple factor of capacitive and non-capacitive half wave and full wave rectifier.
12. To Study and verify clipper and clamper with biased circuits.
13. To find the characteristics of CB and CE amplifiers.
14. Determine the characteristics of FET.
15. To find out the power energy of various periodic and non-periodic signals.

LEARNING OUTCOMES

1. Acknowledge students about charge, current, voltage and various basic electric circuit laws.
2. Acquaint students about DC circuit analysis and methods.
3. Advanced approach for solving series parallel network of resistors by star delta transformation.
4. Basics of AC circuits elements and various methods involved. Understanding the concepts of rms, average and peak values of AC waveforms and their power factor.
5. Acquaint students about the three phase loads, star delta connections and power. Relation between there phase and line values.
6. Acknowledge students with the use of transformers and its working.
7. To build an ability amongst students regarding the functioning of DC machines and its characteristics.
8. To recognise the need for synchronous machine in our electrical systems, its basic functioning and various advantages over other types of machines.
9. Provide students' knowledge regarding construction and working of three phase and single phase induction motors their application in various practical applications.
10. Provides information regarding the fundamental theory of semiconductor devices, fermi level and concept of doping.
11. Acquaints students with the knowledge of different types diode circuit configuration.
12. Provide students with the capability of analysing the different types of waveforms and to calculate various associated parameters.
13. Basics of different types of transistor configuration, modelling and their application.
14. Basics of communication system, modulation and their types

Text Books

5. Vincent Del Toro, "Principles of Electrical Engineering", Prentice Hall Publication.
6. I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill Publication.
7. Electronics Devices and Circuits, Millman and Halkias, Tata McGraw Hill, 4t h ed.
8. Electronic Communication Systems, John Kennedy , Tata McGraw Hill, 4th ed.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE102	Subject Title	Electrical & Electronics Measurements						
LTP	1-0-2	Credit	2.0	Subject Category	UC	Year	1st	Semester	I/II

OBJECTIVES

- To get Acquaints students with the basic idea of measurement system, its classification and characteristics.
- To acknowledge students about different types of measuring instruments based on the fundamental principle.
- To provide students with knowledge of methods of measuring resistances, inductance and capacitance.
- To provides knowledge regarding the basics of digital Measurement

Philosophy of Measurement:
Methods of Measurement, Measurement System, Classification of instrument system, Characteristics of instruments & measurement system, Errors in measurement & its analysis, Standards.

Analog Measurement of Electrical Quantities:
Permanent Magnet Moving Coil, Moving Iron type of Ammeters & Voltmeters, Electrodynamic Wattmeter,

Measurement of Parameters: Different methods of measuring low, medium and high Resistances, measurement of Inductance & Capacitance with the help of AC Bridges.

Digital Measurement:
Concept of digital measurement, Block diagram.

LEARNING OUTOCOMES

1. Acknowledge students with the methods of measurement, classification of instruments system.
2. Acquaint students about characteristics of instruments and their operation.
3. Provides knowledge about basics of error measurement and methods of reducing it.
4. Basics of different types of measuring instruments based on the fundamental theory of operation.
5. Acknowledge students with the methods of measuring low, medium and high resistance.
6. Acknowledge students with the methods of measuring inductance and capacitance using different bridge configuration.
7. Provides knowledge regarding the fundamental of digital measurement, techniques and its application.

Text Book:

1. E.W. Golding & F.C. Widdis, “Electrical Measurement &Measuring Instrument”, A.W. Wheeler & Co. Pvt. Ltd. India.
2. A.K. Sawhney, “Electrical & Electronic Measurement & Instrument”, Dhanpat Rai & Sons, India.

Electrical and Electronics Measurement (Labs)

1. Calibration of ac voltmeter and ac ammeter.
2. Measurement of form factor of a rectified sine wave and determine source of error if r.m.s. value is measured by a multi-meter.
3. Measurement of phase difference and frequency of a sinusoidal ac voltage using C.R.O.
4. Measurement of power and power factor of a single phase inductive load and to study the effect of capacitance connected across the load on the power factor.
5. Measurement of low resistance by Kelvin's double bridge.
6. Measurement of voltage, current and resistance using dc potentiometer.
7. Measurement of inductance by Maxwell's bridge.
8. Measurement of inductance by Hay's bridge.
9. Measurement of inductance by Anderson's bridge.
10. Measurement of capacitance by Owen's bridge.
11. Measurement of capacitance by De Sauty Bridge.
12. Measurement of capacitance by Schering Bridge.
13. Study of A to D convertor and its realization.
14. Study of D to A convertor and its realization.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	MA102	Subject Title	Engineering Mathematics-II						
LTP	3-1-0	Credit	3.5	Subject Category	UC	Year	1st	Semester	I/II

OBJECTIVE: To introduce the fundamentals in Matrices and Linear Algebra, Ordinary Differential Equations, Infinite Series, Laplace Transform and Fourier Series relevant to engineering applications.

UNIT I: Linear Algebra

Matrices, Elementary row and column operations, row reduced echelon form, rank of a matrix, invertible matrices. Consistency and solution of a system of linear equations. Properties of R^n as a vector space, Linear Dependence and Independence of elements in R^n, Basis of a Vector Space, Vector Space of polynomials over R and its basis, Matrix transformation, Rank-Nullity Theorem, Similar Matrices, Eigen-values and Eigen-vectors, Cayley–Hamilton theorem and its applications. Diagonalization of Matrices.

UNIT II: Differential Equations

Methods of solving differential equations of first order and first degree, Bernoulli equation, Solutions of linear differential Equations of second and higher orders with constant & variable coefficients, Euler-Cauchy linear differential equation, method of variation of parameters. Solution of simultaneous linear differential equations.

UNIT III: Infinite Series

Introduction; Sequences; Series; Convergence; Series of positive terms; Comparison test; Integral test; D'Alembert's Ratio test; Cauchy's root test; Alternating series; Leibnitz rule.

UNIT IV: Fourier Series

Periodic functions; Fourier series of Periodic functions; Euler‟s formulae; Functions having arbitrary period; Change of intervals; Even and Odd functions; Half range sine and cosine series.

UNIT V: Laplace Transform

Laplace Transform; Existence theorem; Properties of Laplace Transform ; Laplace Transform of derivatives and integrals; Laplace Transform of Periodic functions; Unit Step function and Error Function; Dirac- Delta function. Inverse Laplace Transform and their properties, Convolution theorem; Applications of Laplace Transform to solve linear and simultaneous differential equations pertaining to engineering problems.

Outcome: Familiarity with fundamental tools of Matrices and Linear Algebra, Ordinary Differential Equations, Infinite Series, Laplace Transforms and Fourier Series relevant to engineering applications

Text Books:

1. R. K. Jain & S. R. K. Iyenger, Advanced Engineering Mathematics, 2nd Edition, Narosa Publishing House, New Delhi, India, 2006.

Reference Books:

1. W. E. Boyce and R. Di Prima, Elementary Differential Equations, (8th Edition), John Wiley & Sons, U.K., (2005).
2. B. S. Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publication, New Delhi, India, 2012
3. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, U.K., 2006.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	HS102	Subject Title	Corporate Communication and Soft Skills						
LTP	2-1-1	Credit	3.0	Subject Category	UC	Year	1st	Semester	I/II

OBJECTIVES

- To introduce to students to the business & corporate environment and its expectations.
- To help students to identify and sharpen their personal and professional skills.
- To ensure employability of students through a perfect blend of hard & soft skills.

Unit I-Business Communication10 hrs

Importance & Features of Business Communication, Flow of Communication: Channels & Networks
Communication: E mails & E- Tools
Business Presentation
Business Etiquette, Telephonic Etiquette
Business Letter Writing
Job Application Letter & Resume
Interview Skills, Impression Management:

Unit II-Personal Skills for Corporate Communication **10 hrs**

SWOT Analysis: Self-Assessment, Identifying Strength & Weakness
Self-Awareness, Self-Disclosure & Self-Management (Stress, Anger)
Goal Setting: Personal & Professional Goals, SMART-ER Goals
Human Perception: Understanding People, Perceptions, Attitudes
Personality (Personality Test)

Unit III-Professional Skills for Corporate Communication **10 hrs**

Decision Making: Techniques, Six Thinking Hats
Creative Thinking, Lateral Thinking
Team Building & Leadership Skills
Time Management: Planning Organizing, Time Wasters
Conflict Resolution Skills
Negotiation Skills

LEARNING OUTCOMES

- Students identify their goals and through enhanced soft skills work towards achieving them.
- Greater self-confidence and knowledge of life skills helps them to develop healthier interpersonal relationships.
- Prepares the students to face future challenges and excel in their personal and professional lives.

TEXT BOOKS

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005.

REFERENCE BOOKS

1. The Seven Habits of Highly Effective People by Steven R. Covey. 2007.
2. How to win Friends and influence People by Dale Carnegie. 2009.
3. Soft Skills: Know Yourself & Know the World by Dr. Alex . S. Chand Publications 2001.
4. The ACE of Soft Skills: Attitude, Communication and Etiquette for Success by Gopalswamy Ramesh. 2008.
5. Managing Soft skills for Personality development by B. N Ghosh. 2006.
6. Personality Development by Elizabeth B. Hurlock. TMH Publication. 2010.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS102	Subject Title	Computer Programming in C++						
LTP	3-0-2	Credit	4.0	Subject Category	UC	Year	1st	Semester	I/II

OBJECTIVE

To introduce object oriented programming concepts and implement them in C++.

Unit -1 **8L**

Introduction to Object Oriented Programming, including methodologies, programming techniques, Object Oriented languages.

Overview of C++ basic structures, including the main () function, C++ data types, different type of operators expressions and statements, standard Input/output, Simple flow of control, Defining user defined Functions.

Unit -2 **8L**

General overview of objects and classes, Object and classes in C++, including class definition, Defining members inside or outside, accessing of members, constructors, types of constructors, destructors and Pointer to class object.

Unit-3 **8L**

Polymorphism: function overloading, methods of overloading, constructor overloading, Operator overloading.

General overview of inheritance: Introduction, Categories of inheritance, public/protected/private inheritance, constructors and destructors in derived classes, and Virtual Base class.

Unit-4 **8L**

Function overriding and virtual functions, Abstract class and abstract base class, Friend functions, Templates in C++, function templates, class templates, templates and inheritances, templates and static members.

Unit-5 **8L**

File handing in C++: opening of file, closing of file, text files, binary files, Reading and writing into a file. Exception Handling in C++, including usage, try, throw and catch.

LEARNING OUTCOMES

At the end of the course the students shall be able to:

- Differentiate between procedure oriented programming and object oriented programming.
- Understand the three key features of the object-oriented programming language: encapsulation (abstraction), inheritance, and polymorphism.
- Know the benefits of object oriented programming.
- Identify the differences between private, public and protected members of a class.
- Declare and use static data members and static methods.
- Design and use friend functions and friend classes.
- Use constructor and destructor functions to initialize and destroy class objects.
- Use inheritance to build class hierarchies.
- Overload operators to work with user-defined classes.
- Implement programs for file Handling.
- Identify benefits of using virtual functions.

Text Books-

1. Kip R. Irvine, C++ and Object Oriented Programming, Prentice hall, 1997
2. R. Lafore, Object Oriented Programming using C++, BPB publications, 2004
3. E Balaguruswamy, Object Oriented Programming with C++, TMH 2nd edition

Reference Books-

1. Schildt Herbert, C++ Programming, 2nd edition, Wiley
2. Yashwant Kanethkar, Object Oriented Programming using C++, BPB, 2004

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	ME101	Subject Title	Engineering Mechanics						
LTP	3-1-0	Credit	3.5	Subject Category	UC	Year	1st	Semester	I/II

Course Objective:

The objective of this course is to make students to learn basic engineering mechanics concepts and will help in solving problems involving forces, loads and moments and to know their applications in allied subjects. The course will develop engineering aptitude in field of application of science and technology.

Unit 1: Introduction to Engineering Mechanics

Introduction: Idealization of bodies, physical quantities- units and dimensions, Scalars and vectors, Laws of mechanics, system of forces and its classification, Principle of superposition, transmissibility of forces. (2 Hrs)

Resultant of concurrent force system

Parallelogram Law of forces, Resolution of forces, Principle of resolved parts; Numerical problems on composition of coplanar concurrent force systems. (2 Hrs)

Resultant of non-concurrent force system :

Moment of a force, Couple, Equivalent force - couple system, Numerical problems on resultant of non-concurrent force system. (3 Hrs)

Unit 2: Equilibrium and Friction

Equilibrium of system of forces - Definition of Equilibrant; Free body diagram, Equilibrium of two and three force system, Conditions of static equilibrium, Lami's theorem. (3 Hrs)

Application- Static Friction in rigid bodies in contact

Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; Impending motion on horizontal and inclined planes; Numerical Problems on single and two blocks on inclined planes, ladder and wedge friction. (4 Hrs)

Unit 3: Analysis of Plane truss and Beam

Support Reaction in beams: Types of beams, Types of Loads and Supports, statically determinate beams, Numerical problems on support reactions for statically determinate beams with Point load (Normal and inclined) and uniformly distributed and uniformly varying loads and Moments. (3 Hrs)

Plane Truss: Perfect and imperfect truss Assumptions and Analysis of Plane Truss by Method of joints and Method of section. (4 Hrs)

Unit 4: Centroids and Moments of Inertia of Engineering Sections

Centroids:Introduction to the concept, Centroids of line and area, Centroids of basic geometrical figures, computing Centroids for regular and composite cross-sections. (4 Hrs)

Moment of Inertia : Introduction to the concept, Radius of gyration, Parallel axis theorem, Perpendicular axis theorem, Moment of Inertia of basic planar figures, computing moment of Inertia for regular and composite cross-sections. (4 Hrs)

Unit 5: Kinematics and kinetics

Kinematics of particles: Motion related to Cartesian and polar coordinates, motion curves, relative motion and dependent motion. Projectile motion, tangential and normal components of acceleration. (4 Hrs)

Kinetics of particles: Newton's second law of Motion; Energy principles; Impulse momentum principle; direct central impact. (3 Hrs)

LEARNING OUTCOMES

1. Identify principles of mechanics used in real life engineering problems.
2. Know basics of Engineering based on force application, and selection of materials in application.
3. Understand the action of Forces, Moments and other loads on systems of rigid bodies;
4. Compute the reactive forces and the effects that develop as a result of the external loads;
5. Locate the Centroids and compute the Moment of Inertia of regular cross-sections.
6. Express the relationship between the motions of bodies
7. Equipped to pursue studies in allied courses in Mechanics.

Text Books:

1. A. Nelson, "Engineering Mechanics: Statics & Dynamics", Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 1st edition, 2009.Reprint 2016
2. S.S. Bhavikatti, "Engineering Mechanics", New Age International Publishers Ltd., New Delhi, 3rd edition, SI Metric 2009.

Reference Books:

1. S. Timoshenko, D.H. Young, J.V. Rao and S. Pati, "Engineering Mechanics", TATA McGraw-Hill Education, New Delhi, 5th edition, 2013.
2. F.P. Beer and E.R. Johnson, "Mechanics for Engineers- Dynamics and Statics", Tata McGraw-Hill, 3rd SI Metric edition, 2008.
3. I.H. Shames and G.K.M. Rao, "Engineering Mechanics: Statics & Dynamics", Pearson Education India, 4th edition, 2005.
4. A.R. Basu, "A Text book of Engineering Mechanics", Dhanpat Rai & Co.(P) Ltd., 2003.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	ME102	Subject Title	Mechanical Measurements						
LTP	1-0-2	Credit	2.0	Subject Category	UC	Year	1st	Semester	I/II

Course Objective:
To educate students on different measurement systems and to share application of principle of metrology and measurements as applied in industries. To learn laboratory skills, conduct experiments and identify sources of variability.

Measurement-Basics:
Unit & Dimension, Traceability, Calibration, Least count, Error, Accuracy, Precision, Uncertainty, Repeatability, Reproducibility and Steadiness.

Measurement - Solids:
Inside / Outside Diameter, Height / Depth, Eccentricity / Run-out, Taper, Backlash (play), Thermal conductivity

Measurement - Material Properties:
Metals, Non-metals & Polymers, Measurement of mechanical properties as Tensile strength, Impact Strength and Hardness, Mass Moment of Inertia of rigid body and Poission's Ratio.

Measurement - Fluids:
Density, Specific Gravity, Specific volume, Surface Tension & Viscosity Measurement, open channel discharge & velocity measurement, Heat Engine and Heat exchanger.

List of Experiments
1. Error Analysis and Graph drawing and Evaluation.
2. Measurement of inside & outside diameter, taper, run-out etc.
3. Measurement of thermal conductivity of a material.
4. Tensile test.
5. Impact test.
6. Hardness test.
7. Measurement of Mass Moment of Inertia of rigid body.
8. Measurement of Poission's ratio.
9. Surface tension & viscosity measurement.
10. Open channel simple techniques flow measurement.
11. Others

LEARNING OUTCOMES
- Demonstrate excellent laboratory skills, conduct experiments and Identify sources of variability
- Analyse, interpret, and present measurement data from measurements/experiments
- Enhance ability to apply knowledge of mathematics, statics, physics and engineering sciences
- Gain eye hand coordination, enhance psycho motor skills and attitude.

Text Books

1. B.C. Nakra and K.K. Chaudhry, "Instrumentation, Measurement and Analysis", Tata McGraw-Hill Pvt. Ltd., New Delhi, 5th edition, 2015.
2. E.O. Doeblin and D.N. Manik, "Doeblin's Measurement Systems", McGraw Hill Education, 6th ed

Lab Manual

1. DIT Engineering Measurements Lab Manual, ME Department Aug 2017

Reference Books:

1. SP Venkateshan IIT Madras, Mechanical Measurements 2nd Edition; e-Book,
2. NPLaboratory, Beginners guide to measurements in Mech Engineering, UK; e-Book

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	ME103	Subject Title	Engineering Graphics						
LTP	0-0-3	Credit	1.5	Subject Category	UC	Year	1st	Semester	I/II

Course Objective:

To improve the visualization skills and to develop an understanding of the theory of projection. To enable the students with various concepts like dimensioning, conventions and standards related to working drawings in order to become professionally efficient.

Contents:

1. **Introduction**: Importance of graphics in engineering applications, Sheet Layout, Size of Sheets, Title blocks, Type of lines, Lettering, Dimensioning, Scale (Full, Reduced, Large)
2. **Projection:**Methods of Projection, Planes of Projection, Projection of points, Projection of straight lines, Projection of planes.
3. **Projection:** Projection of solids.
4. **Orthographic views:** Machine parts with dimensioning.
5. **Freehand sketching**: Isometric Projections; Introduction and basics.
6. **AutoCAD**: Introduction to Commands, Explaining need of AutoCAD over Manual drafting.

Mode: The contents of the subject needs to be delivered in the form of basic teaching process in one hour of the three hours practice session , such that the student is able to understand the basic principles before initiating drawings.

Exam: Engg Graphics will have both Mid Term and End Term Practical Exams

Learning Outcomes:

- To enable students to acquire and use engineering drawing skills as a means of accurately and clearly communicating ideas, information and instructions.
- To enable students to acquire requisite knowledge, techniques and attitude required for advanced study of engineering drawing.
- Understand AutoCAD commands and appreciate the need of AutoCAD over Manual Drafting.

Text Books:

1) N. D. Bhatt and V.M. Panchal, "Engineering Drawing", Charotar Publishing House Pvt. Ltd., 53rd edition, 2016 reprint.
2) P.S. Gill, "Engineering graphics", S. K. Kataria & Sons, 13th edition, 2016.

Reference Books:

1) D.A. Jolhe, "Engineering Drawing", Tata McGraw-Hill Education Pvt. Ltd., 1st edition, 2008.
2) K.C. John, "Engineering graphics", PHI Learning Pvt. Ltd., 2nd edition, 2010.
3) F.E. Giesecke, A. Mitchell, H.C. Spencer, I.L. Hill, J.T. Dygdon, J.E. Novak, "Technical Drawing", Prentice Hall, 12th edition, 2003

List of Experiments/ Drawing sheets (L+P)

1. One sheet on Lettering and Geometric construction. (1+4 Hrs)
2. One sheet on Basics of Projection of points and lines. (2+4 Hrs)
3. One sheet on Projection of Planes. (2+4 Hrs)
4. One sheet on Projection of Solids. (2+4 Hrs)
5. One sheet on Orthographic views of simple isometric blocks. (1+4 Hrs)
6. One sheet on Free hand sketches and Basic Isometric Projections. (0+4 Hrs)
7. Basic AutoCAD commands. (1 +3Hrs)

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CH101	Subject Title	Engineering Chemistry						
LTP	3-1-2	Credit	4.5	Subject Category	UC	Year	1st	Semester	I/II

OBJECTIVE: To provide a summary on water chemistry, water treatment, green chemistry and synthetic chemistry. The course intends to provide an overview of the working principles, mechanism of reactions and application of the building blocks like batteries, fuel cells, polymers and an overview of surface coatings in order to protect the metal. This course relies on elementary knowledge of polymers, engineering materials and basics of nanotechnology to illustrate the concepts involved. To provide an impression of organic chemistry, spectroscopy, biomolecules, fuels and lubricants .To gain the knowledge on existing & future upcoming devices, materials and methodology.

Unit 1. Water Treatment and Analysis **(08 Lectures)**

Standards for drinking water, Water Quality parameters, Determination of alkalinity of water, Hardness of water: Units and determination. Demineralization of water, Softening of water: Limesoda Process, Ion exchange process, Zeolite process and RO process. Internal conditioning methods: Carbonate conditioning, Phosphate conditioning, Colloidal conditioning, Calgon conditioning. Desalination of brackish water.

Unit 2. Electrochemistry & Corrosion **(06 Lectures)**

Migration of ions, Transference number, Determination of Transference number by Hittorf`s method, Conductometric titrations, Types of electrode: Calomel and glass electrode, Liquid junction potential, Potentiometric Titrations,Corrosion and its economical aspects, Types of corrosion: Galvanic, Erosion, Crevice, Pitting, Waterline, Soil, Microbiological. Theories of corrosion: Acid, Direct Chemical attack, Electrochemical. Corrosion prevention by metallic, organic/inorganic coatings and corrosion inhibitors

Unit 3. Polymers & Biomolecules **(10 Lectures)**

Introduction; Classification of Polymers; Functionality; Mechanism of Polymerization; Plastics; Individual Polymers; LDPE, HDPE, PVC, Polystyrene, Bakelite, Teflon, PMMA, PET, Nylon-6, Rubbers (BUNA-S and BUNA-N); Speciality Polymers (Conducting Polymers, Silicones and Polycarbonates),Gypsum, Plaster of Paris ,Insulating Materials. Structural and functional attributes of cell and cell organelles; Biomolecules (Proteins, Carbohydrates, Lipids, Enzymes, Nucleic acids). r-DNA technology and its applications in industry, health, environment and agriculture. Microbial technology and its common applications.

Unit 4. Fuels, Battery& Lubrication **(08 Lectures)**

Classification of fuels, Calorific value, Cetane number, Octane number, fuel quality, Comparison of solid, liquid and gaseous fuel, properties of fuel, alternative fuels: Biofuels, Power alcohol and synthetic petrol, Battery, Photovoltaic cell, Metal-air battery, Lithium and nickel battery. Introduction of Lubricants, Functions of Lubricants, Classification of lubricants, Mechanisms of Lubrication, Properties of Lubricants.

Unit 5. Green Chemistry & Nano Chemistry **(08 Lectures)**

Emergence of green chemistry, Twelve principle of green chemistry, use of alternative feedstock(biofuels),Use of innocuous reagents, use of alternative solvents, design of safer chemicals, designing alternative reaction methodology, minimizing energy consumption. Introduction to Nano chemistry, properties of Nanomaterials, preparation of nanomaterial, self -assembly, Nanomaterials, Applications of Nanomaterials

LIST OF PRACTICALS

1. Determination of alkalinity in the given water sample.
2. Estimation of temporary and permanent hardness in water sample using EDTA as standard solution.
3. Calculation of percentage of available chlorine in bleaching powder.
4. Chloride content in the given water sample by Mohr's method.
5. Determination of iron content in the given ore by using external indictor
6. pH-metric titration.
7. Proximate Analysis of coal sample
8. Condutometric titration.
9. Synthesis of Phenol formaldehyde resin
10. Viscosity of a lubricant by Redwood Viscometer
11. Flash and Fire point determination of a Lubricant
12. Calorific value of a fuel sample by Bomb calorimeter.
13. Determination of order of reaction in ester hydrolysis reaction
14. 14.To determine the DO in a given water sample
15. To study the adsorption of acetic acid on activated charcoal

LEARNING OUTCOME: Ability to know and to understand the various process of removing the hardness of water and principles of green chemistry. Understand the operating principles and the reaction mechanisms of batteries and fuel cells. Students will be able to apply this knowledge to the analysis and design of batteries. Hydrogen fuel cell technology is used in automobiles in order to reduce environmental pollution. Electrochemistry concept is used to know the Corrosion treatment process of alloys. An ability to identify and formulate polymers and have a knowledge of various polymers like polyethene, PVC, PS, Teflon, Bakelite, Nylon which have engineering applications. To gain acquaintance regarding biomolecules and their application in engineering. An ability to handle various instruments like spectroscope, flame photometer etc. Have a knowledge of synthesizing Nano materials and their applications in industry. Know the properties of Fuels and Lubricants. Have a scope in the area of Material Chemistry.

Text Books Recommended:

1. Engineering Chemistry by Shikha Agarwal. Cambridge University Press Edition 2015.
2. Engineering Chemistry by S. Vairam & Suba Ramesh. Wiley India Pvt. Ltd. 2014.

Reference Books:

1. Environmental Chemistry by Stanley E. Manahan. CRC Press Taylor and Francis.
3. Organic Chemistry by Morrison and Boyd. Pearson.
4. Physical Chemistry by Atkins. Oxford University Press.
5. Concise Inorganic Chemistry by J.D. Lee. Oxford University Press.
6. Basic Biotechnology by S Ignacimuthu. Tata Mcgraw-Hills
7. Spectroscopy by Silver Stein. Pearson.
8. Nano: The essentials by T. Pradeep. McGraw Hill Education.
9. Biochemistry by Stryer Lubert. Mcmillan learning. 2015.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CH201	Subject Title	ENVIRONMENTAL SCIENCE					
LTP	2 0 0	Credit	0	Subject Category	AC	Year	2nd	Semester	III

OBJECTIVE

To impart basic knowledge about the environment and its allied problems and to develop an attitude of concern for the environment. Further the course structure will create the awareness about environmental problems among students and motivate the students to participate in environment protection and environment improvement programs. The course aims to develop skills to help the concerned individuals in identifying and solving environmental problems.

Unit 1: Basics of Environment and Natural Resources: 04 Hrs

Definition and Concept of Environment, Multidisciplinary nature of environmental studies. Scope and importance of environmental studies, Need for public awareness, Environmental concerns and people. Introduction and classification of natural resources. Energy Resources, Water Resources, Land Resources, Forest Resources, Food Resources, Mineral Resources, Case studies related to over exploitation of resources and their impacts. Role of an individual in conservation of natural resources, Sustainable lifestyles.

Unit 2: Ecosystems: 04 Hrs

Definition and concept of ecology, Structure and Function of an Ecosystem, Energy Flow in Ecosystems, Biogeochemical cycles (Nitrogen, Carbon, Phosphorus, Oxygen, Hydrological). Species interactions in ecosystems. Ecological succession and ecological pyramids. Characteristic features of grassland, pond, desert and forest ecosystems. Ecosystem services and conservation.

Unit 3: Biodiversity and its conservation: 04 Hrs

Introduction and types of biodiversity. Bio-geographic classification of India, Value and significance of biodiversity, Biodiversity at global, national and local levels, India: A mega-diversity nation, Biodiversity hotspots, Threats to Biodiversity: Poaching and man-wildlife conflicts, IUCN Red Data Book and endangered & endemic species of India. Biodiversity conservation strategies, Institutes and organizations.

Unit-4 Environmental Pollutions: 05 Hrs

Introduction and Definition. Causes, consequences and control measures of: Air pollution, Water pollution, Noise pollution, Nuclear pollution, Soil pollution, Thermal and Marine pollution. Solid waste management, Bio-medical waste management. Disasters and its mitigation strategies, Global warming, Climate change, Acid rain, Ozone depletion and Smog. Pollution case studies. Role of an individual in pollution prevention.

Unit-5 Social Issues and Environment: 04 Hrs

Sustainable Development: Concept and importance, Environmental Impact Assessment (EIA), GIS, Remote sensing. Water conservation and rain water harvesting. Resettlement and rehabilitation problems, Environmental audit, eco-labeling and eco-friendly business. Environmental Legislation in India, Population explosion and its impact on environment and human health, Value Education and environmental ethics.

Field work: 03 Hrs

- Visit to a local area to document environmental asset: river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common flora and fauna.
- Study of a common ecosystem-pond, river, hill slopes, etc.

Course Outcome:

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

CO1. Demonstrate depleting nature of Environmental Resources and Ecosystem concepts.
CO2. Able to identify the structure and functioning of natural ecosystems.
CO3. Establish man-wildlife harmonious relationship.
CO4. Adapt to 3R (Reuse, Recovery, Recycle).Identify the causes and control measures related to Pollutions.
CO 5. Illustrate and analyse various Case Studies related to Environmental issues and Env. Legislation.

TEXT BOOKS

1. BharuchaErach, 2004. Textbook for Environmental Studies, University Grants Commission, New Delhi.
2. Kaushik A & Kaushik C P. 2007. Perspectives in Environmental Studies, New Age International Publ.
3. S. Deswal & A. Deswal 2015. A Basic Course in Environmental Studies. Dhanpat Rai & Co.

REFERENCES

1. Miller T.G. Jr. 2002. Environmental Science, Wadsworth Publishing Co. (TB).
2. De A.K.,1996. Environmental Chemistry, Wiley Eastern Ltd.
3. Sharma, P.D. 2005. Ecology and environment, Rastogi Publication.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	HS244	Subject Title	INDIAN CONSTITUTION					
LTP	2 0 0	Credit	0	Subject Category	AC	Year	2nd	Semester	III

OBJECTIVE

To familiarize the students with the features of the Indian Constitution
To provide a knowledge of their constitutional rights

Unit 1 Introduction **5 Hrs**

Constitution- meaning of the term, basic features Indian Constitution: Sources and constitutional history. Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive, Principles of State Policy, debates on Fundamental Rights and Directive. 1 Hr

Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive, Principles of State Policy, debates on Fundamental Rights and Directive. 4 Hrs

Unit 2Union Government and its Administration **6 Hrs**

Structure of the Indian Union: Federalism, Centre- State relationship, 2 Hrs

President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha 2 Hrs

Institutional Functioning: Prime Minister, Parliament and Judiciary, Power Structure in India: Caste, class and patriarchy 2 Hrs

Unit 3 State Government and its Administration **3 Hrs**

Governor: Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions 3 Hrs

Unit-4 Local Administration **7 Hrs**

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected, Representative, CEO of Municipal Corporation. 3 Hrs

Pachayati Raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy 4 Hrs

Unit V: Election Commission **5 Hrs**

Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

COURSE OUTCOME:

CO 1 Enable the students to protect their rights
CO 2 The students will be engaged in the political system of India

TEXT BOOKS

- Abbas, H., Kumar, R. & Alam, M. A. (2011) Indian Government and Politics. New Delhi: Pearson, 2011.
- Chandhoke, N. & Priyadarshi, P. (eds.) (2009) Contemporary India: Economy, Society, Politics. New Delhi: Pearson.

REFERENCE BOOKS

- Chakravarty, B. & Pandey, K. P. (2006) Indian Government and Politics. New Delhi: Sage.
- Chandra, B., Mukherjee, A. & Mukherjee, M. (2010) India after Independence. New Delhi: Penguin.
- Singh, M.P. & Saxena, R. (2008) Indian Politics: Contemporary Issues and Concerns. New Delhi: PHI Learning.
- Vanaik, A. & Bhargava, R. (eds.) (2010) Understanding Contemporary India: Critical Perspectives. New Delhi: Orient Blackswan.
- Menon, N. and Nigam, A. (2007) Power and Contestation: India since 1989. London: Zed Book.
- Austin, G. (1999) Indian Constitution: Corner Stone of a Nation. New Delhi: Oxford University Press.
- Austin, G. (2004) Working of a Democratic Constitution of India. New Delhi: Oxford University Press.
- Jayal, N. G. & Maheta, P. B. (eds.) (2010) Oxford Companion to Indian Politics. New Delhi: Oxford University Press.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	MA201	Subject Title	ENGINEERING MATHEMATICS – III						
LTP	3 1 0	Credit	4	Subject Category	SC	Year	2nd	Semester	III

Objective:

- Introduce the fundamentals in Complex variable.
- Solving Partial Differential Equations.
- Legendre polynomial of first kind with properties.
- Bessel function of first kind and its properties.

UNIT I: Complex variable- I (8)

Elementary functions, limit, continuity & differentiability, Analytic Functions; Cauchy – Riemann equations, Harmonic functions, Line integral in the complex plane, Cauchy's Integral theorem, Cauchy's Integral formula for derivatives of analytic function.

UNIT II: Complex Variables -II (6)

Power series, Taylor's series, Laurent's series, Poles, Zeros, Singularities, Residue Theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$ and $\int_{-\infty}^{\infty} f(x)dx$.

UNIT III: Special Functions (8)

Series solution of ODE of 2nd order with variable coefficient with special emphasis to Legendre and Bessel differential equation by Frobenious method, Legendre polynomial of first kind, Bessel function of first kind and their properties.

UNIT IV: Fourier Transform & Z-transform (8)

Fourier integral, Fourier transform, Fourier sine and cosine transforms, Linearity, Scaling, frequency shifting and time shifting properties, Convolution theorem and its application.

Z – Transform, Properties of Z-transforms, Convolution of two sequences, Inverse Z-transform, Solution of difference equations.

UNIT V: Partial differential equations and its Applications (8)

Introduction to partial differential equations; Linear partial differential equations with constant coefficients of second order and their classification; Method of Separation of Variables for solving Partial Differential Equations, One-Dimensional Wave Equation, One Dimensional heat equation.

Course Outcomes:

- Familiarity with methods of solving partial differential equations.
- Learn differentiation and Integration of complex functions.
- Solving real integrals with complex integration.
- Learn Fourier and Z-transform rules with applications.

Text Books:

1. J.W. Brown & R. V. Churchill: Complex Variables & Applications, 9th edition, McGraw-Hill, 2013.
2. R. K. Jain & S. R. K. Iyenger, Advanced Engineering Mathematics, 2nd Edition, Narosa Publishing House, New Delhi, India, 2014.

Reference Books:

1. B. S. Grewal, Higher Engineering Mathematics, 42th Edition, Khanna publication, New Delhi, India, 2012.
2. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, U.K., 2006.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE201	Subject Title	BASIC NETWORK ANALYSIS						
LTP	3 1 2	Credit	5	Subject Category	DC	Year	2nd	Semester	3rd

Objectives of the Course

- *This course aims to provide basic understanding of the different types of continuous time signals and systems and their mathematical representation.*
- *The students will get understanding of different network theorems with their application to ac networks.*
- *The course will provide knowledge of transforming the continuous time domain signal into frequency domain signal by the application of Laplace transform, Fourier transform and Z transform.*

Unit 1 **INTRODUCTION TO CONTINUOUS TIME SIGNALS AND SYSTEMS:**

Basic continuous time signals, unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and characteristics. Waveform synthesis. Introduction to various types of systems, Causal and Non-causal, Stable and Unstable, Linear and Non-linear, Time invariant and Time varying systems. **8L**

ANALOGOUS SYSTEM: Mechanical elements for translational and rotational systems, force-voltage and force-current analogy, torque-voltage and torque-current analogy.

Unit 2 **NETWORK THEOREMS (APPLICATIONS TO AC NETWORKS) :**

Super- position theorem, Thevenin‟s theorem, Norton‟s theorem, maximum power transfer theorem, Reciprocity theorem. Millman‟s theorem, compensation theorem, Tellegen‟s theorem. **8L**

Unit 3 **LAPLACE TRANSFORM ANALYSIS**:

Laplace Transform, Laplace Transform of periodic functions, Initial and Final Value Theorems, Inverse Laplace Transform, Convolution Theorem, Superposition Integral, Application of Laplace Transform to analysis of networks, waveform synthesis and Laplace Transform of complex waveforms. **8L**

Unit 4 **FOURIER SERIES AND FOURIER TRANSFORM ANALYSIS:**

Exponential form and Trigonometric form of Fourier series, Fourier symmetry, Fourier Integral and Fourier Transform. Transform of common functions and periodic wave forms: Applications of Fourier Transform to network analysis. **8L**

Unit 5 **Z TRANSFORM ANALYSIS:**

Introduction, Spectrum analysis of sampling process, Signal reconstruction, Difference equation, Z- transform, Z-transform function, Inverse Z-transform, Relation of z- and s-transform, Stability analysis, Application of z-transform. **8L**

Text Books:

1. William Hayt, Jack Kemmerly, Steven Durbin, “Engineering Circuit Analysis”, Tata McGraw Hill, 8th Edition
2. B.P. Lathi, “Linear Systems & Signals” Oxford University Press, 2008.

Reference Books

1. .Kuo, “Network Analysis & Synthesis”, Wiley India.
2. ME Van-Valkenberg; “Network Analysis”, Prentice Hall of India

Outcome of the Course:

Having successfully completed this course, the student will demonstrate:

- An ability to design and analyse electrical circuits.
- An ability to control AC and DC circuits by using Basic Electrical devices.
- An ability to visualize and work on laboratory and multi-disciplinary tasks.

List of Experiments

1. Verification of principle of superposition with dc and ac sources.
2. Verification of Thevenin's theorem with dc and ac sources.
3. Verification of Norton's theorem with dc and ac sources.
4. Verification of Maximum power transfer theorems in ac circuits.
5. Verification of Tellegen's theorem for two networks of the same topology.
6. Determination of transient response of current in RL circuit with step voltage input.
7. Determination of transient response of current in RC circuit with step voltage input.
8. Determination of frequency response of current in RLC circuit with sinusoidal ac input.
9. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values.
10. Determination of frequency response of a Twin – T notch filter.

Value Added Experiments

1. Verification of Thevenin's theorem and Norton's theorem ac source in MATLAB/Simulink.
2. Verification of Maximum power transfer theorems for ac circuit in MATLAB/Simulink.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE202	Subject Title	ELECTROMECHANICAL ENERGY CONVERSION- I						
LTP	3 1 2	Credit	5	Subject Category	DC	Year	2nd	Semester	3rd

Objectives of the Course

- To empower students to understand the basics of electro mechanical energy conversion & transformer

Unit 1 **Principles of Electro-mechanical Energy Conversion**

Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems (defining energy & Co-energy), Singly Excited Systems; determination of mechanical force, mechanical energy, torque equation, Doubly excited Systems; Energy stored in magnetic field, electromagnetic torque, Generated emf in machines; torque in machines with cylindrical air gap . **8L**

Unit 2 **D.C. Machines**

Construction of DC Machines, Armature winding, Emf and torque equation Armature Reaction, Commutation, Interpoles and Compensating Windings, Performance Characteristics of D.C. generators. **8L**

Unit 3 **D.C. Machines (Contd.)**

Performance Characteristics of D.C. motors, Starting of D.C. motors; 3- point and 4-point starters, Speed control of D.C. motors: Field Control, armature control and Voltage Control (Ward Leonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburne's Test). **8L**

Unit 4 **Single Phase Transformer**

Phasor diagram, efficiency and voltage regulation, all day efficiency, Testing of Transformers: O.C. and S.C. tests, Sumpner's test, polarity test. Auto Transformer: Single phase and three phase auto transformers, volt-amp relationship, efficiency, merits & demerits and applications. **8L**

Unit 5 **Three Phase Transformers**

Construction, three phase transformer phasor groups and their connections, open delta connection, three phase to 2 phase (Scott connection), 6 phase or 12 phase connections, and their applications, parallel operation and load sharing of single phase and three phase transformers, excitation phenomenon and harmonics in transformers. **8L**

Text Books:

1. P.S.Bhimbra, "Electrical Machinery", Khanna publication.
2. I.J. Nagrath & D.P.Kothari, "Electrical Machines". Tata McGraw Hill

Reference Books

1. Charles Gross, Electric Machines, T & F, Delhi

Outcome of the Course:

- To familiarise students about dc machines, transformer, current, voltage and various circuit laws involved in analysis.
- To provide students with the basic knowledge of operation and working of DC machines & transformer and their application

List of Experiments

1. To obtain magnetization characteristics of a d.c. shunt generator.
2. To obtain external characteristics of a d.c. shunt generator and compound generator.
3. To obtain efficiency of a dc shunt machine using Swinburne's test.
4. To perform Hopkinson's test and determine losses and efficiency of DC machine.
5. To obtain speed-torque characteristics of a dc shunt motor.
6. To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control.
7. To obtain speed control of dc separately excited motor using Conventional Ward-Leonard.
8. To study polarity and ratio test of single phase and 3-phase transformers.
9. To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using O.C. and S.C. tests.

Value Added Experiments

- To obtain efficiency and voltage regulation of a single phase transformer by Sumpner's test.
- To obtain 3-phase to 2-phase conversion by Scott connection.
- To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE203	Subject Title	MEASUREMENTS & INSTRUMENTATION						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	2nd	Semester	3rd

Objectives of the Course

- *To acquire knowledge regarding the use, measure and analyse the instruments.*
- *To be able to calculate all the parameters related to measurements.*
- *To develop an understanding about different instruments that are used for measurement purpose.*
- *To have knowledge about digital methods used for measurement of different quantities.*

Unit 1	**Philosophy Of Measurement:** Methods of Measurement, Measurement System, Classification of instrument system, Characteristics of instruments & measurement system, Errors in measurement & its analysis, Standards. Analog Measurement of Electrical Quantities: Electrodynamic, Thermocouple, Electrostatic & Rectifier type Ammeters & Voltmeters, Electrodynamic Wattmeter, Three Phase Wattmeter, Power in three phase system, errors & remedies in wattmeter and energy meter	**8L**
Unit 2	**Instrument transformers:** Instrument Transformer and their applications in the extension of instrument range, Introduction to measurement of speed, frequency and power factor.	**8L**
Unit 3	**Measurement of Parameters:** Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the help of AC Bridges, Q Meter.	**8L**
Unit 4	**AC Potentiometer:** Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement **Magnetic Measurement:** Ballistic Galvanometer, flux meter, determination of hysteresis loop, Measurement of iron losses.	**8L**
Unit 5	**Digital Measurement of Electrical Quantities:** Concept of digital measurement, block Diagram, Study of digital voltmeter, frequency meter Power Analyzer and Harmonics Analyzer; Electronic Multimeter.	**8L**

Text Books:

1. E.W. Golding & F.C. Widdis, "Electrical Measurement &Measuring Instrument", A.W. Wheeler & Co.Pvt. Ltd..
2. A.K. Sawhney ,"Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons , India .

Reference Books

Forest K. Harries,"Electrical Measurement", Willey Eastern Pvt. Ltd. India .

M.B. Stout ,"Basic Electrical Measurement" ,Prentice hall of India,India.

3. W.D.Cooper, "Electronic Instrument & Measurement Technique", Prentice Hall International.

Outcome of the Course:

Develop an understanding of construction and working of different measuring instruments

Develop an understanding of construction and working of different AC and DC bridges and its applications

Develop an ability to use measuring instruments and AC and DC bridges for measurement

List of Experiments

1. Calibration of ac voltmeter and ac ammeter
2. Measurement of phase difference and frequency of a sinusoidal ac voltage using C.R.O.
3. Measurement of low resistance by Kelvin's double bridge
4. Measurement of voltage, current and resistance using dc potentiometer
5. Measurement of inductance by Maxwell's bridge
6. Measurement of inductance by Hay's bridge
7. Measurement of inductance by Anderson's bridge
8. Measurement of capacitance by Owen's bridge
9. Measurement of capacitance by De Sauty Bridge
10. Measurement of capacitance by Schering Bridge

Value added Experiments:

1. Measurement of power and power factor of a single phase inductive load and to study effect of capacitance connected across the load on the power factor

2. Measurement of form factor of a rectified sine wave and determine source of error if r.m.s.value is measured by a multi-meter
3. Study of Frequency and differential time counter

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EC211	Subject Title	ANALOG AND DIGITAL ELECTRONICS						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	2nd	Semester	3rd

Objectives of the Course

- To teach the basic concept of various analog and digital electronic devices, circuits and their application
- To develop ability among students for problem formulation, system design and solving skills
- To have basic knowledge of amplifiers and oscillators

Unit 1	**FUNDAMENTALS OF SEMICONDUCTORS AND DIODES:** Review of energy bands in solids, Intrinsic and Extrinsic semiconductors, Fermi Level, Transport phenomenon in semiconductors: diffusion current, drift current, mobility, conductivity. The Hall Effect. Generation and recombination of carriers. Special Diodes- LED, Varactor diode, Photo diode, Schottky diode, Tunnel diode; their characteristics and applications.	**8L**
Unit 2	**BJTs AND FET**s : Construction and characteristics of transistor, Transistor biasing and stability factor analysis. Transistor application as an amplifier and as a switch. Small signal analysis of BJT using re and h-parameter model. Types, construction and characteristics of JFET, Biasing of JFET, FET small signal analysis. Construction and characteristics of Depletion and Enhancement types of MOSFET. Low and High frequency response of BJT and FET amplifiers.	**8L**
Unit 3	**FEEDBACK AMPLIFIERS AND OSCILLATORS CIRCUITS:** Introduction to positive and negative feedback: Negative feedback -current, voltage, Series and Shunt type. It's effect on input impedance, output impedance, voltage gain, current gain and bandwidth. Oscillators circuits: Frequency of oscillation and condition for sustained oscillations. Types of oscillator circuits-RC-phase shift, Wein-Bridge, Hartley, Clapp, Colpitt and Crystal Oscillators.	**8L**
Unit 4	**FUNDAMENTALS OF DIGITAL SYSTEMS:** Combinational Logic Circuits: Review of logic gates and Boolean Algebra, Adder, Subtractor. Introduction to Multiplexers and Demultiplexers & Encoders andDecoders. Sequential Logic Circuits: Introduction to latches, Flip-flops, Registers and Counters.	**8L**
Unit 5	**OPERATIONAL AMPLIFIERS AND SEMICONDUCTOR MEMORIES** : Introduction to Operational Amplifiers, Characteristics of an ideal op-amp, Inverting and Non-inverting amplifier, Application of op-amp as summer, differential amplifier, Integrator and Differentiator. Semiconductor Memories: Memory organization and classification of memories.	**8L**

Text Books:

Boylstead and Neshelsky, ," Electronic Devices and Circuits", PHI

Jacob Millman & Christos C. Halkias," Integrated Electronics" Tata McGraw Hill, 1991.

Malvino & Leach, "Digital Principles and applications" Tata Mc. Graw Hill

R.A. Gayakwad "Op amps and Linear Integrated Circuits" Prentice Hall of India.

Reference Books

Taub & Schilling "Digital Electronics"- Tata Mc Graw Hill

Anil K. Maini, "Digital Electronics: Principles and Integrated circuits" Wiley India Ltd, 2008.

Millman, J. and Grabel A, "Microelectronics" Mc Graw Hill

S Salivahanan, N Suresh Kumar, "Electronic Devices and Circuits", 3rd edition, McGraw Hill Publication, 2013.

Outcome of the Course:

- **Students will be able to build analog and digital electronics circuits**
- **Students should be able to design and analyze amplifiers**
- **Students should be able to develop model and analyze oscillators**

List of Experiments

To Plot V-I characteristics of junction diode and zener diode.

To Plot input / output characteristics for common base transistor.

To Plot input /output characteristics of FET and determine FET parameters at a given operating point.

To determine voltage gain, current gain, input impedance and output impedance of common emitter amplifier.

To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.

To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the frequency of oscillation.

To study transistor as a switch and determine load voltage and load current when the transistor is ON.

Implementation of All Logic Gates using Universal gates (NAND & NOR both).

To study operation of Adder / Subtractor

To study application of Operational Amplifier as summer integrator and voltage comparator

Value added experiments:

To study operation IC 555 based astable and monostable multibrators.

To study operation of (a) multiplexer using IC 74150 (b) demultiplexer using IC 74138.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Humanities Electives I

Subject Code	**HS241**	**Subject Title**	**Education and Social Change**						
LTP	**2-0-0**	**Credit**	2	**Subject Category**	Elective	**Year**	**II**	**Semester**	IV

Course Objective

- To define the various types of education policies
- To understand the role in striving for social change.
- To overview on education and its implications on social changes to the students.

Unit 1 **6 Hrs**

General introduction to the place of learning in society. Learning, education and training.
Changing meanings of education across time and society. A brief historical perspective on education in India.

Unit 2 **6 Hrs**

Social-political arithmetic as a spurious way of understanding education and social change.
Structural functionalist perspectives and structural-conflict perspectives on education

Unit 3 **7 Hrs**

Class, conflict, legitimation processes, reproduction of society. Anarchist perspectives. "New" Sociology of Education. Symbolic interactionist perspectives on education. Resistances to schooling. Critical theory and education.

Unit 4 **7 Hrs**

Neo-Weberian perspectives on education. Status politics and education. Caste, class, gender and education in India. Indian thinkers on education. Current debates on the place of education in India.

LEARNING OUTCOME:

- The students will understand how theeducation system assesses the importance of education in society.
- The students will be able to take a significant action in area of education to maintain social change
- The student will be able to participate in the changes required in society.
- Education will be used as a tool to implement adequate changes in society.

TEXT BOOKS

1. Desai, A.R. (2005), *Social Background of Indian Nationalism,* Popular Prakashan.
2. Giddens, A (2009), *Sociology*, Polity, 6th ed.

REFERENCE BOOKS

- Guha, Ramachandra (2007), *India after Gandhi,* Pan Macmillan.
- Sharma R.S. (1965), *Indian Feudalism,* Macmillan.
- Deshpande, Satish (2002), *Contemporary India: A Sociological View,* Viking.
- Gadgil, Madhav & Ramachandra Guha(1993), *This Fissured Land: An Ecological History of India,* OU Press.
- Haralambos M, RM Heald, M Holborn (2000), *Sociology*, Collins.
- Mohanty, M (ed.) (2004), *Class, Caste & Gender- Volume 5,* Sage.
- Dhanagare, D.N., *Themes and Perspectives in Indian Sociology,* Rawat

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Humanities Electives I

Subject Code	HS242	Subject Title	Introduction to Psychology						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	II	Semester	IV

Course Objective

- To understand the basic psychological processes and their applications in everyday life.

Unit 1Introduction **5Hrs.**

Psychology as a science, perspective, origin and development of Psychology, Psychology in India, Methods: experimental and case study.

Unit 2 Cognitive Processes-Perception **7Hrs.**

Nature of perception, laws of perceptual organization, learning, conditioning observational learning, memory processing, information processing model, techniques for improving memory

Unit 3 Motivation and Emotion **7Hrs.**

Motives: Biogenic and Sociogenic; Emotion: Nature of Emotions, key Emotion

Unit 4 Personality and Intelligence-Personality **7Hrs.**

Nature and Theories; Intelligence: Nature and Theories

Course Outcome:

- The students will develop an understanding of the various psychological processes to maintain their daily activities
- The students will understand themselves better.
- The students will be better equipped for life.
- The Students will be able to demonstrate critical and creative thinking and scientific approach to understand human behaviour.

Text Books:

1. Baron, R.A. and Misra, G., Psychology (Indian Subcontinent Edition). Person Education Ltd. (2014)
2. Chndha, N.K. & Seth, S., The Psychological Realm: An Introduction. Pinnacle Learning, New Delhi. (2014)

REFERENCE BOOKS:

- Ciccarelli, S.K. & Meyer, G.E., Psychology (South Asian Edition). New Delhi: Tata Mc Graw Hill. (2008)
- Glassman, W.F., Approaches to Psychology (3rd Ed.) Buckingham: Open University Press. (2000)
- Passer, M.W., Smith, R.E., Holt, N. and Bremmer, A., Psychology: The Science of Minand Behaviour, McGraw-Hill Education, UK. (2008)

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Humanities Electives I

Subject Code	HS243	Subject Title	Science, Technology & Society						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	II	Semester	IV

Course Objective

To increase the basic understanding of students towards science and technology, and basic implications of science & technology on social development**.**

Unit 1 **5Hrs.**

Introduction of society, Sociological imagination, the two revolutions and their socio-economic technological and scientific implications; Social significance of science and technology, ideas beyond technology.

Unit 2 **5Hrs.**

Perspectives on relations between science and technology; Sociological perspective on scientific knowledge: Karl Marx, Emile Durkheim and Karl Mannhen's Sociology of knowledge; Merton's approach to science and technology.

Unit 3 **7Hrs.**

Ethos of science, Matthew effect in science,Thomas theorem and Mathew effect; Thomas Kunn's notions paradigm and paradigm-based science, Scientific community and growth of scientific knowledge.

Unit 4 **9Hrs.**

Science in India: science and technology policies in India, Scientific communities and their linkages, national and international Science, Ethics in science & engineering, environment and science and technology

COURSE OUTCOME:

- Enable students to examine the role of science and technology in social and economic development.
- The students will understand perspectives on relations between science and technology.
- The student will be able to understand the scientific temper & its social significance.
- The student will be able to understand and implement technological policies for the betterment of society.

TEXT BOOKS

1. Federic A. Lyman: Opening Engineering Students Mind to Idea to Ideas Beyond Technology. IEEE Technology and Society Magazine, Fall, pp.16-23. (2002)
2. John Theodore Rivers: Technology and the use of Nature. Technology in Society, 25(3), August, pp.403-416 (2003).

REFERENCE BOOKS

- Ronald R. Kline: Using History & Sociology to Tech Engineering Ethics. IEEE Technology and Society Magazine, Winter, pp.13-20 (2002).
- V.V. Krishna: A portrait of the scientific community in India: Historical Growth and Contemporary Problems, Gaillard et al. (eds). Scientific Communities in the Developing World, Sage (1997

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Humanities Electives I

Subject Code	**HS245**	**Subject Title**	**Ethics & Self Awareness**						
LTP	**2-0-0**	**Credit**	2	**Subject Category**	Elective	**Year**	**II**	**Semester**	IV

Course Objective

- To introduce the concepts pertaining to ethical and moral reasoning and action
- To develop self – awareness

Unit 1 Introduction **4Hrs.**

Definition of Ethics; Approaches to Ethics: Psychological, Philosophical, Social.

Unit 2 Psycho-social theories of moral development **4Hrs.**

View of Kohlberg,Morality and Ideology, Culture and Morality, Morality in everyday context

Unit 3 **8Hrs.**

Ethical Concerns: Work Ethics and Work Values, Business Ethics, Human values in organizations, Self-Awareness: Self Concept: Johari Window, Self and Culture, Self-Knowledge, Self-Esteem

Unit 4 **11Hrs.**

Perceived Self-control, Self-serving bias, Self-presentation, Self-growth: Transactional Analysis and Life Scripts. Self-Development: Character strengths and virtues, Emotional intelligence, Social intelligence, Positive cognitive states and processes (Self-efficacy, Empathy, Gratitude, Compassion, and Forgiveness).

COURSE OUTCOME

- Students will develop an understanding of the ethical values and their application in daily activities
- Students will learn business ethics and work ethically in every sphere.
- Students will understand themselves better and develop healthy interpersonal relationships.
- Students will be able to develop themselves into wholesome personalities.

TEXT BOOKS

1. Leary M.R., "The Curse of Self: Self-awareness, Egotism and the Quality of Human Life", Oxford University Press. 2004
2. Louis P. P., "The Moral Life: An Introductory Reader in Ethics and Literature", Oxford University Press. 2007

REFERENCE BOOKS

- Corey, G., Schneider Corey, M., & Callanan, P., "Issues and Ethics in the Helping Professions", Brooks/Cole. 2011
- Snyder, C.R., Lopez, Shane, J., & Pedrotti, J.T., "Positive Psychology" Sage, 2nd edition. 2011

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE204	Subject Title	ELECTRICAL POWER GENERATION						
LTP	3 0 0	Credit	3	Subject Category	DC	Year	2nd	Semester	4th

Objectives of the Course

- The objective of the course is that after studying this subject the student should become familiar with the different modes of electrical power generation, their advantages and limitations.
- He should also become aware of the various components and their working which are involved in the process of electrical power generation.
- He should have fair idea about energy generation and cost structure for revenue generation by energy

Unit 1	**Introduction:** Present energy scenario in India, **Power Plant Economics and Tariffs:** Load curve, load duration curve, different factors related to plants and consumers, Cost of electrical energy, depreciation, generation cost, effect of Load factor on unit cost. Fixed and operating cost of different plants, role of load diversity in power system economy. Objectives and forms of Tariff including three part tariff; Causes and effects of low power factor, advantages of power factor improvement, different methods for power factor improvements	**8L**
Unit 2	**Thermal Power Plant:** Site selection, general layout and operation of plant, Rankine cycle, Function of pulverization, boiler, economizer, super heater, air pre-heater, ESP, turbine and pump. Classification of steam turbines,impulse and reaction turbines velocity diagrams **Gas Turbine Plant:** Operational principle (Brayton cycle) of gas turbine plant & its efficiency, fuels, open and closed-cycle plants, regeneration, inter-cooling and reheating, role and applications, **Diesel Plants:** Diesel plant layout, components & their functions, its performance, role and applications	**8L**
Unit 3	**Nuclear Power Plant:** Location, site selection, general layout and operation of plant. Brief description of different types of reactors , Moderator material, fissile materials, control of nuclear reactors, disposal of nuclear waste material, shielding. **Hydro Electric Plants:** Classifications, location and site selection, detailed description of various components, general layout and operation of Plants, brief description of impulse, reaction, Kaplan and Francis turbines, advantages & disadvantages	**8L**
Unit 4	**Major Electrical Equipment in Power Plants:** Differences between generators used in steam and hydro power plants, requirement of excitation systems, types of excitation systems, **Cogeneration:** Introduction, types of cycles and technologies, advantages and scope in India **Captive Generation:** Introduction, advantages and constraints	**8L**
Unit 5	**Solar power plant:** Working of solar power plant, Solar energy collectors, Photovoltaic cell, merits and limitations of solar power plant **Wind Energy:** site selection for wind power plant, differences between horizontal and vertical axis turbines, power developed using wind turbine and its efficiency Introduction to Geothermal energy, Ocean Energy and Tidal energy, Introduction to fuel cells.	**8L**

Text Books:

B.R. Gupta, "Generation of Electrical Energy", S. Chand Publications

Reference Books

1. Elements of Electric Power Station Design by M.V. Deshpande
2. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar , "A Text Book on Power System Engineering", Dhanpat Rai & Co
3. J.B. Gupta, "A Course in Electrical Power", Kataria Publications

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE205	Subject Title	ELECTROMECHANICAL ENERGY CONVERSION- II						
LTP	3 1 2	Credit	5	Subject Category	DC	Year	2nd	Semester	4th

Objectives of the Course

- To empower students with the advanced understanding of AC machines.
- To empower students to have sufficient knowledge about synchronous machines
- To empower students to have sufficient knowledge about induction machines

Unit 1	**Synchronous Machine I:** Constructional features, Armature winding, EMF Equation, Winding coefficients, equivalent circuit and phasor diagram, Armature reaction, Working principle of synchronous generator, O. C. & S. C. tests, Voltage Regulation using Synchronous Impedance Method, MMF Method, Potier's Triangle Method, Parallel Operation of synchronous generators, operation on infinite bus, synchronizing power and torque co-efficient	**8L**
Unit 2	**Synchronous Machine II:** Two Reaction Theory, Power flow equations of cylindrical and salient pole machines, Operating characteristics Synchronous Motor: Working principle of synchronous motor, Starting methods, Effect of varying field current at different loads, V-Curves, Hunting & damping, synchronous condenser.	**8L**
Unit 3	**Three phase Induction Machine – I:** Constructional features, Rotating magnetic field, Principle of operation , Phasor diagram, equivalent circuit, torque and power equations, Torque- slip characteristics, no load & blocked rotor tests, efficiency, Induction generator	**8L**
Unit 4	**Three phase Induction Machine- II:** Starting, Deep bar and double cage rotors, Cogging & Crawling, Speed Control (with and without emf injection in rotor circuit.)	**8L**
Unit 5	**Single phase Induction Motor:** Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, repulsion motor. AC Commutator Motors: Universal motor, stepper motors	**8L**

Text Books:

P.S.Bhimbra, "Electrical Machinery", Khanna publication.

I.J. Nagrath & D.P.Kothari, "Electrical Machines". Tata McGraw Hill

Reference Books

Charles Gross, Electric Machines, T & F, Delhi

Outcome of the Course:

- Student becomes familiar with the elementary AC machines other than transformers
- To empower students with the advanced knowledge about principle of operation and applications of synchronous machines.
- To empower students with the advanced knowledge about principle of operation and applications of induction machines.

List of Experiments

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE206	Subject Title	ENGINEERING MATERIALS						
LTP	3 0 0	Credit	3	Subject Category	DC	Year	2nd	Semester	4th

Objectives of the Course

- In this course student will learn the Crystal structure of materials
- The student will learn about electron theory of materials
- The student will learn about thermal conductivity and study the material properties according to use in electrical equipment.

Unit 1	**Crystal Structure of Materials:** Bonds in solids, crystal structure, co-ordination number, atomic radius representation of plane distance b/w two planed packing factor, Miller Indices, Bragg's law and x-ray diffraction, structural Imperfections, crystal growth	**7L**
Unit 2	**Electrical Engineering Material:** Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, Half effect, Drift and Diffusion currents, continuity equation, thermoelectric effect, superconductivity and super conducting materials, optical properties of solids.	**8L**
Unit 3	**Magnetic Material:** Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism and Ferrimagnetism, magnetostriction, Properties of magnetic materials, soft and hard magnetic materials, permanent magnetic materials.	**8L**
Unit 4	**Dielectric Materials:** Polarization and Dielectric constant, Dielectric constant of mono-atomic, Poly atomic gases and solids, frequency dependence of electronic and ionic polarisabilities, dipolar relaxation, dielectric loss, piezoelectricity, ferroelectric materials	**8L**
Unit 5	**Semiconductor Material And Devices:** Properties of semiconductors, Conductivity of insulators, Metals and semiconductor in terms of energy bands, Intrinsic and Extrinsic semiconductors, Concentration of charge carriers, Hall effect, Drift and Diffusion current, semiconductor junction diode, Integrated circuits, semiconducting materials.	**7L**

Text Books:

A.J. Dekker, "Electrical Engineering Materials",Prentice Hall of India

R. K. Rajput, "Electrical Engineering Materials", Laxmi Publications

Reference Books

Solymar, "Electrical Properties of Materials" Oxford University Press.

Ian P.Hones, "Material Science for Electrical & Electronic Engineering," Oxford University Press.

J.B.Gupta, "Electrical and Electronics Engineering Materials" Katson publishers.

Outcome of the Course:

Types of engineering materials.

Various phenomena associated with different types of materials.

Applications of these materials in different fields.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE207	Subject Title	MICROPROCESSORS						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	2nd	Semester	4th

Objectives of the Course

- The student will learn how the hardware and software components of a microprocessor-based system work together to implement system-level features and integrating digital devices into microprocessor-based systems;
- The student will learn the operating principles of, and gain hands-on experience with, common microprocessor peripherals such as timers, USART, and PPI; role of CPU, registers, and modes of operation of 8085 and 8086 microprocessor.
- Learning Microprocessor instruction sets and learning assembly-programming styles, structured assembly language programming.

Unit 1	Evolution of Microprocessors, history of computers, Introduction to Microprocessor, Microprocessor systems with bus organization, Microprocessor Architecture & Operations, Tristate devices, buffers, encoder, decoder, latches, Memory devices: Semiconductor memory organization, Category of memory, I/O Device.	**8L**
Unit 2	Register organization, 8085 Microprocessor Architecture, Address, Data and Control Buses, Pin Functions, Demultiplexing of Buses, Generation of Control Signals, Timing diagrams: Instruction Cycle, Machine Cycles, T- States, Concept of Address line and Memory interfacing, Address Decoding and Memory Interfacing.	**8L**
Unit 3	Classification of Instructions, Addressing Modes, 8085 Instruction Set, Instruction And Data Formats, Writing assembly language programs, Programming techniques: looping, counting and indexing, Stack & Subroutines, Developing Counters And Time Delay Routines, Code Conversion, BCD Arithmetic And 16-Bit Data Operations. The 8085 Interrupts, 8085 vector interrupts.	**8L**
Unit 4	Memory interfacing, I/O interfacing – memory mapped and peripheral mapped I/O Programmable Interfacing Devices Like 8255A PPI, 8253/8254 Timer, 8259A PIT, 8237 DMA Controller, and Serial I/O Concepts 8251A USART. Interfacing of above chips with 8085, Programming them In Different Modes.	**8L**
Unit 5	A Architecture of 8086, block diagram, register set, flags, Queuing, concept of segmentation, Pin description, operating modes, addressing modes.	**8L**

Text Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085 Ramesh S. Gaonkar - Penram International
2. Microcomputers and Microprocessors: The 8080, 8085 and Z-80 Programming, Interfacing and Troubleshooting John E. Uffenbeck..

Reference Books

1. Microprocessor and Microcontroller fundamentals. The 8085 and 8051 Hardware and Software William Kleitz

Outcome of the Course:

- Identify the basic element and functions of microprocessor.
- Describe the architecture of microprocessor and its peripheral devices.
- Demonstrate fundamental understanding on the operation between the microprocessor and its interfacing devices.
- Apply the programming techniques in developing the assembly language program for microprocessor application.
- An ability to design microprocessors based system, components or process as per needs and specifications

List of Experiments

1. To perform 8-bit arithmetic operations between two numbers stored at consecutive memory locations: addition, subtraction, multiplication, division.
2. To perform 16-bit arithmetic operations between two numbers stored at consecutive memory locations: addition, subtraction, multiplication, division.
3. To find the largest and smallest element in an array. Also find the sum of elements in an array.
4. Generation of Fibonacci series in 8085 in hexadecimal sequence.
5. Write and execute the program for finding even and odd numbers.
6. To sort the given number in the ascending and descending order using 8085 microprocessor.
7. Code conversion: decimal number to hexadecimal, hexadecimal number to decimal.
8. To add two 8 bit BCD numbers stored at consecutive memory locations.
9. To subtract two 8 bit BCD numbers stored at consecutive memory locations.
10. To interface programmable peripheral interface 8255 with 8085 and study its characteristics in mode0, mode1 and BSR mode.

Value added Experiments:

To interface 8253 Interface board to 8085 mp and verify the operation of 8253 in six different modes.

To interface a stepper motor with 8051 microcontroller and operate it.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE208	Subject Title	NETWORK ANALYSIS & SYNTHESIS						
LTP	3 1 2	Credit	5	Subject Category	DC	Year	2nd	Semester	4th

Objectives of the Course

- This course aims to provide knowledge of graph theory applicable for analysis of electrical circuits.
- The students will get understanding of circuit analysis in transient and steady state condition.
- The students will get understanding of different two port network parameters.
- The course will provide knowledge of active and passive filters.

Unit 1 **GRAPH THEORY:** Graph of a Network, definitions, tree, co tree, link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix, Duality, Loop and Node methods of analysis. Analysis of first and second order linear systems by classical method. **8L**

Unit 2 **TRANSIENT CIRCUIT ANALYSIS:** Natural response and forced response, Transient response and steady state response for arbitrary inputs (DC and AC), Evaluation of time response both through classical and Laplace methods. **8L**

Unit 3 **NETWORK FUNCTIONS AND TWO PORT NETWORKS :** Concept of complex frequency, Transform impedances network functions of one port and two port networks, Concept of poles and zeros, Properties of driving point and transfer functions.

Two Port Networks: Characterization of LTI two port networks; Z, Y, ABCD, A'B'C'D', g and h parameters, Reciprocity and symmetry, Inter-relationships between the parameters, Inter- connections of two port networks, Ladder and Lattice networks: T & Π representation. **8L**

Unit 4 **NETWORK SYNTHESIS**: Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms. **8L**

Unit 5 **FILTERS:** Introduction, Classification of filters, Image parameters and characteristics impedance, passive and active filter, low pass, high pass, constant K type, M derived filters and their design. **8L**

Text Books:

William Hayt, Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis", Tata McGraw Hill , 8th Edition

ChoudharyD.Roy, "Network & Systems", Wiley Eastern Ltd.

Reference Books

Kuo, "Network Analysis & Synthesis", Wiley India.

Jagan, "Network Analysis", B S Publication.

ME Van-Valkenberg; "Network Analysis", Prentice Hall of India

Outcome of the Course:

- An ability to design and analyse electrical circuits.
- An ability to control AC and DC circuits by using Basic Electrical devices.
- An ability to visualize and work on laboratory and multi-disciplinary tasks.

List of Experiments

To determine node voltages and branch currents in a resistive network using MULTI-SIM software. To obtain Thevenin‟s equivalent circuit of a resistive network.

To obtain transient response of a series R-L-C circuit for step voltage input using MULTI-SIM software.

To obtain transient response of a parallel R-L-C circuit for step current input using MULTI-SIM software.

To obtain transient response of a series R-L-C circuit for alternating square voltage waveform using MULTI-SIM software.

To obtain frequency response of a series R-L-C circuit for sinusoidal voltage input using MULTI-SIM software.

To determine line and load currents in a three phase delta circuit connected to a 3-phase balanced ac supply.

To plot magnitude, phase and step response of a network function using MULTI-SIM software.

To determine Z, Y, G, H and transmission parameters of a two part network.

To obtain transient response of output voltage in a single phase half wave rectifier circuit using capacitance filter.

Verification of cascade connection of 2, two -port networks.

Value added Experiments

Verification of superposition theorem using MULTI-SIM software.

Verification of reciprocity theorem using MULTI-SIM software.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE301	Subject Title	CONTROL SYSTEM						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	3rd	Semester	V

Objectives of the Course

- To introduce the state variable representation of continuous and discrete data control systems, stability analysis and time response analysis using state model,
- The concepts of controllability and observability, basic concepts of digital control systems, their stability analysis,
- Use of state feedback for pole placement design, basic concepts and stability analysis of non linear systems

Unit 1	**The Control System:** Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback	**8L**
Unit 2	**Time Response analysis:** Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants. Controllers: Introduction to P, PI, & PID controller. performance indices	**8L**
Unit 3	**Control System Components**: Constructional and working concept of ac servomotor, synchros and stepper motor. **Concept of Stability:** Routh-Hurwitz criteria, Root Locus Technique	**8L**
Unit 4	**Frequency response Analysis:** Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots: gain margin and phase margin. **Stability in Frequency Domain:** Nyquist stability criterion, relative stability.	**8L**
Unit 5	**Introduction to Design:** The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain.	**8L**

Text Books:

1. I.J. Nagrath & Gopal, "Control System Engineering", 4th Edition, New age International.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India.

Reference Books

1. Norman S. Nise, Control System Engineering 4th edition, Wiley Publishing Co.
2. M.Gopal, "Control System; Principle and design", Tata McGraw Hill.
3. M.Gopal," Modern Control system", Tata McGraw Hill.
4. D.Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.

Outcome of the Course:

- Possess in-depth knowledge of concepts from classical control theory, understand the concept of transfer function.
- Find out the time response of a given system and design of different basic controller (P, PI, PID)
- Understand the basic knowledge of servo & servomotor.
- Gain knowledge of finding out system stability in time and frequency domain.
- To draw different plots of control system and compensation design using these plots.

List of Experiments

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.

5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output V/S input characteristics
7. To determine speed-torque characteristics of an ac servomotor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behaviour of separately excited dc motor in open loop and closed loop conditions at various loads.
10. To study PID Controller for simulation proves like transportation lag.

Software based experiments (Use MATLAB, LABVIEW software etc.)

1. To determine time domain response of a second order system for step input and obtain performance parameters.
2. To convert transfer function of a system into state space form and vice-versa.
3. To plot root locus diagram of an open loop transfer function & determine range of gain 'k' for stability.
4. To plot a Bode diagram of an open loop transfer function.
5. To draw a Nyquist plot of an open loop transfer functions and examine the stability of the closed loop system.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE302	Subject Title	ELEMENTS OF POWER SYSTEM						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	3rd	Semester	V

Objectives of the Course

- To give an overview of power system and its various components and their importance.
- Calculation of line parameters, evaluation of line performance
- Mechanical aspects of overhead transmission line, underground cables, their constructional features

Unit 1	**POWER SYSTEM COMPONENTS:** Single line diagram of Power System, Supply system, Different types of supply system and their comparison, Transmission line configurations, Types of conductors, Skin effect, Kelvin's law, Proximity effect.	**8L**
Unit 2	**OVER HEAD TRANSMISSION LINES:** Calculation of inductance and capacitance of single phase, three phase, single circuit, and double circuit transmission lines. Representation of short, medium and long transmission lines, Ferranti effect, Surge impedance loading	**8L**
Unit 3	**CORONA AND LINE Insulators**: Corona formation, calculation of potential gradient, corona loss, factors affecting corona, Methods of reducing corona and interference. Electrostatic and electromagnetic interference with communication lines. Types of insulators and their application, Potential distribution over a string of insulators, Methods of equalizing the potential, String efficiency	**8L**
Unit 4	**Mechanical Design of Transmission Lines:** Catenary curve, Calculation of sag & tension, Effects of wind and ice loading, Sag template, Vibration dampers, Types of towers and their design	**8L**
Unit 5	**Insulated Cables:** Types of cables and their construction , Dielectric stress, Grading of cables, Insulation resistance, Capacitance of single phase and three phase cables, Dielectric losses, Heating of cables.	**8L**

Text Books:

1. W.D. Stevenson, "Element of Power System Analysis", McGraw Hill, USA
2. C.L. Wadhwa, "Electrical Power Systems", New Age International Ltd., Third Edition
3. Ashfaq Husain, "Power System", CBS Publishers & Distributors, India
4. B.R. Gupta, "Power System Analysis & Design", S.Chand & Co, Third Edition
5. M.V. Deshpande, " Electrical Power System Design", Tata McGraw Hil

Reference Books

1.Soni, Gupta & Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & Sons, India
2.S.L. Uppal, " Electric Power", Khanna Publishers
3.S.N. Singh, "Electric Power Generation, Transmission & Distribution", PHI, New Delhi

Outcome of the Course:

- The students should be able to know about the overhead and underground types of transmission systems,
- The students should be able to know about different mathematical models to represent different types of transmission lines and evaluate their performance.
- They should also be able to design an overhead transmission line including mechanical aspects.
- They will also know about different types of cables used in case of electrical power systems.

List of Experiments	MATLAB based

1. To compute line parameters for a single phase transmission line
2. To compute line parameters for a three phase short transmission line
3. To compute line parameters for a three phase medium transmission line
4. To compute line parameters for a three phase long transmission line
5. Verification of Ferranti Effect for Different Length Transmission Lines
6. To calculate sag in case of transmission lines
7. To calculate voltage regulation of transmission line using MATLAB
8. To carry out modelling of 3 phase AC cable

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EC204	Subject Title	ELECTROMAGNETIC FIELD THEORY						
LTP	3 1 0	Credit	4	Subject Category	DC	Year	3rd	Semester	V

Objectives of the Course

- The concept of electromagnetic field
- The electromagnetic wave and their propagation
- Transmission lines and wave guides.

Unit 1	**COORDINATE SYSTEMS AND TRANSFORMATION:** Cartesian Coordinates, Circular Cylindrical Coordinates, Spherical Coordinates Vector Calculus: Differential Length, Area and Volume, Line Surface and Volume Integrals, Del Operator, Gradient of a Scalar, Divergence of a Vector and Divergence Theorem, Curl of a Vector and Stoke's Theorem, Laplacian of a Scalar.	**8L**
Unit 2	**ELECTROMAGNETIC WAVE PROPAGATION:** Faraday's Law, Electromotive Forces, Displacement Current, Derivation of Maxwell's Equations For Static and Time-Varying Fields, Differential and integral forms, concept of displacement current, Boundary conditions.	**8L**
Unit 3	**ELECTROMAGNETIC WAVE PROPAGATION APPLICATIONS:** Electromagnetic Wave Propagation: Wave Propagation in Lossy Dielectrics, Plane Waves in Lossless Dielectrics, Plane Wave in Free Space, Plane Waves in Good Conductors, Power and The Poynting Vector, Reflection of a Plane Wave at Normal incidence.	**8L**
Unit 4	**TRANSMISSION LINES:** Transmission Lines: Transmission Line Parameters, Transmission Line Equations, Input Impedance, Standing Wave Ratio and Power, Smith Chart, Some Applications of Transmission Lines, Low loss RF and UHF transmission lines, Distortion less condition. Transmission line charts-impedance matching	**8L**
Unit 5	**WAVEGUIDES:** Wave Guides: Introduction to Planar (Rectangular) Waveguides, Derivation of TE and TM Modes, TEM Mode, Impedance and characteristics impedances. Transmission line analogy for wave guides, Attenuation and factor of wave guides, Resonators.	**8L**

Text Books:

1.M N O Sadiku, 'Elements of Electromagnetics'.

2.William Hayt, 'Engineering Electromagnetics', McGraw-Hill

Reference Books

1. .John Kennedy, 'Electronic Communication Systems', Tata McGraw Hill, 4th edition.
2. K. D. Parsad, 'Electromagnetic Fields'.

Outcome of the Course:

- **The students will understand the nature of electric field and magnetic field.**
- **The students will be able to analyse and solve the problems involving the electromagnetic waves.**

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EC341	Subject Title	TRANSDUCERS AND INSTRUMENTATION						
LTP	3 0 2	Credit	4	Subject Category	Electives	Year	3rd	Semester	V

Objectives of the Course

- To make students understand the Identification, classification construction, working principle and application of various transducers used for Displacement measurement, Temperature measurement, Level measurement, and Miscellaneous measurement
- To make the students learn the selection procedure, applications and comparative study of various Transducers
- To understand the role of the various elements of a measurement system and to specify and evaluate a measurement system for a given application
- To make the students evaluate the technological and physical limitations of a specific sensor and
- propose a suitable sensor for a given measurement situation.

Unit 1	**Transducers:** Definition, principle of sensing & transduction, classification, Static and Dynamic characteristics. Mechanical and Electro-mechanical sensors: Resistive Transducers – potentio-metric type (linear and logarithmic), Strain gauge- resistive and semiconductor type, rosettes. Inductive sensors - Reluctance type, Mutual inductance, LVDT: Construction, material, I/O curve, applications, RVDT, Hall Effect Sensor. Capacitive transducers - variable distance-parallel plate type, variable area-parallel plate, cylindrical type, and variable dielectric constant type. Piezoelectric element: piezoelectric effect, materials.	**8L**
Unit 2	**Thermal Sensors:**Classification, Bimetallic Thermometer, Resistance thermometer (RTD), , Thermistors, Thermocouples – Principle of working, Thermoelectric Laws, Radiation Pyrometers, Optical Pyrometers, Pyrometers, Liquid Crystal Thermometer, Digital Thermometer.	**8L**
Unit 3	**Pressure Sensors:** Types, Manometers, Bourdon Tube – C Type, spiral type, Helical Type, Bellows, Diaphragms, Pressure Measurement using: LVDT, Potentiometer, Photoelectric Transducer.	**8L**
Unit 4	**Opto-Electronic Sensors:** Photo-emissive transducer, Photo-Conductive Transducer, Photo-Voltaic Transducer, Applications of Photo Diode and Photo Transistors as transducers, Optical encoders, Stroboscope, Fibre Optic Sensors.	**8L**
Unit 5	**Miscellaneous Measurements**:Measurements of Liquid Level, Measurement of Humidity, Measurement of pH value, Sound measurement of using Microphone, ultrasonic sensors, Measurement of Nuclear Radiations: Geiger Muller Tube, Scintillation detectors, MEMS Sensors, Introduction to Smart Sensors.	**8L**

Text Books:

1. D. Patranabis, “Sensors and Transducers,” 2nd edition, Prentice Hall of India Private Limited
2. Ian R. Sinclair, “ Sensors & Transducers”, 3rd Edition, Newnes Publications.
3. E.O. Doebelin and Dhanesh N Manik, “Measurement Systems,” 6th Edition, McGraw Hill Education, India

Reference Books

1. B.C. Nakra & K. Chaudhry, “Instrumentation, Measurement and Analysis”, Tata Mc Graw Hill 2nd Edition.
2. A.K. Sawhney and Puneet Sawhney,“Mechanical Measurements & Instrumentation & Control,” Dhanpat Rai & Co., India
3. D.V.S. Murthy, “Transducers and Instrumentation,” Prentice Hall of India Private Limited (2003).

Outcome of the Course:

- Working principles of sensors and transducers.
- Measurement of physical quantities like displacement, temperature, pressure, etc.
- Applications of various transducers used in industry.
- Analyze smart sensors for their relevant applications.

List of Experiments

1.Measurement of unknown resistance with the help of a dc potentiometer.
2.To determine the characteristics of LVDT
3.To determine the characteristics of RVDT.
4.Measurement of strain using strain gauge.
5.Measurement of load using strain gauge based load cell.
6.Temperature measurement using thermocouple.
7.Temperature measurement using RTD.
8.Pressure measurement using Bourdon Tube.
9.Measurement of speed using Stroboscope/optical encoder.
10.Displacement measurement using IR Sensor.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE342	Subject Title	TELEMETRY AND DATA TRANSMISSION						
LTP	3 0 2	Credit	4	Subject Category	Elective	Year	3rd	Semester	V

Objectives of the Course

- To study about various digital modulation techniques
- To study about data handling and data reception systems
- To study about various control systems used and the types of command system
- To study about telemetry systems

Sampling Fundamentals: Introduction to sampling theorem and sampling process, convolution, computing minimum sampling rate. Alising Errors.

Unit 1 Digital Modulation Techniques: Review of PCM, DPCM, Methods of binary data transmission, Data Formats, DM code converters, PSK, QPSK, FSK, probability of error, phase ambiguity resolution and differential encoding, error detection, error correction, error correction codes. **8L**

Unit 2 Data Handling System: Block schematic, Sensors, Signal conditioners, Multiplexing- high level and low level, ADC- range and resolution, Word Format, Frame format, Frame synchronizer codes, R. F. links, X24, RS 422, RS423, RS 232C interfaces, Multi terminal configuration, Multiplier & Concentrator, Data Modems, Data transmission over telephone lines. **8L**

Unit 3 Data Reception Systems: Bit synchronizers, frame synchronizers, subframe synchronizers, PLL, Display systems. **8L**

Unit 4 Remote Control: Communication based processing control systems, pipelines, Operational security systems components, Pipeline control, Power system control, Programmable controllers for factory automation. **8L**
Command: Tone command system, Tone digital command system, ON/OFF command and data commands.

Unit 5 Aerospace Telemetry: Signal formation and conversion, Multiplexing techniques in telecontrol, Industrial telecontrol installations, reliability in telecontrol installations. **8L**

Text Books:

1. Patranabis," Telemetry Principles: Tata Mcgrew Hill.
2. Schweber," Data Communication " Mcgraw Hill.

Reference Books

1.. Berder & Menjewlse," Telemetry Systems".

Outcome of the Course:

- To have knowledge about data sampling and digital modulation techniques used
- To have knowledge and understanding of requirements for data handling and data analysis
- To have knowledge about the techniques to be used for data transmission using various techniques

List of Experiments

1. To plot the Characteristics of Strain gauge
2. To plot the Characteristics of load cell
3. To plot the Characteristics of thermistor
4. To plot the Characteristics of RTD
5. To plot the Characteristics of Thermocouple
6. To study the Loading effect of Potentiometer
7. To plot the Characteristics of Synchros
8. To plot the Characteristics of LVDT
9. To plot the Characteristics of Piezo-electric transducer

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE343	Subject Title	DYNAMIC SYSTEM ANALYSIS						
LTP	3 0 2	Credit	4	Subject Category	Elective	Year	3rd	Semester	V

Objectives of the Course

- To study the mathematical model of systems
- To study time response analysis
- To study the frequency analysis

Unit 1	**Control Concepts and Mathematical Modelin**g System Concepts, Effect of Feedback, System Modeling, Transfer Function, Modeling of Different Types of Physical Systems, Analogy between the Elements of Different Types of Systems. State Variable Representation. Relationship between State Model and Transfer Function.	**8L**
Unit 2	**System Representation and Control Component**s Block Diagram Algebra. Signal Flow Graph and Mason's Gain Formula. State Diagram and Simulation. Introduction to Simulink. Working Principle and Control Applications of Synchros, Tachogenerator, Servomotor and Stepper Motor.	**8L**
Unit 3	**Time Response Analysis**: Time response of First Order and Second Order Systems. Steady State Error and Error Coefficients. State Transition Matrix and Solution of State Equations. Concepts of Stability–Routh-Hurwitz Criterion of Stability. Root Locus Technique.	**8L**
Unit 4	**Frequency Response Analysis** Correlation between Time and Frequency Response. Frequency Response of Second Order System. Bode Plots, Polar Plots, Nichols Chart and Nyquist Stability criterion – Gain Margin and Phase Margin.	**8L**
Unit 5	**Control System Design** Cascade and Feedback Compensation – Design of Lag, Lead, Lag-Lead Compensator Using Bode Plot and Root Locus. Introduction to P, PI and PID Controllers and their Tuning.	**8L**

Text Books:

1.Norman S. Nise, "Control Systems Engineering", Wiley Eastern, 2007.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India 2003.

Reference Books

1. B.C. Kuo, "Automatic Control Systems", Prentice Hall of India, 2002.

Outcome of the Course:

- Apply the knowledge about the Automatic Control System to use them more effectively.
- Fulfill the demands of the industry about the analysis and control of the dynamic systems.
- Describe the State Space Analysis and use it for the stability analysis of the dynamic systems.
- Differentiate different types of controllers and design them for specific applications.
- Design Lag, Lead, Lag-Lead Compensator using Bode Plot and Root Locus techniques and suggest the relative stabilities of different dynamic systems.

List of Experiments

1. To convert a given first order system from transfer function model to state space model.
2. To calculate transfer function of a RLC circuit and study its transient response.
3. To study transient and steady state response of a 1st order system
4. To study transient and steady state response of a 2nd order system
5. To study transient and steady state response of a higher order system
6. To analyse stability of a given plant using root locus.
7. To analyse stability of a given plant using Routh-Hurwitz criteria and Bode plot
8. To design a P controller for a given system
9. To design a PI controller for a given system
10. To design a PID Controller for a given system

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE344	Subject Title	UTILIZATION OF ELECTRICAL ENERGY & TRACTION						
LTP	3 1 0	Credit	4	Subject Category	Elective	Year	3rd	Semester	V

Objectives of the Course

- To introduce the fundamentals of various types of electrical heating and electrical welding applications.
- To introduce the fundamentals of refrigeration, air conditioning and illumination engineering
- To have knowledge about the types of electric traction systems and the fundamentals related to electric traction
- To have knowledge about the types of electric drives and their control mechanisms specially when used in electric traction

Unit 1	**Electric Heating:** Advantage & methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating,	**8L**
Unit 2	**Electric Welding:** Electric arc welding, electric resistance welding, Electric Welding control, **Electrolyte Process:**Principal of Electro deposition, laws of Electrolysis, application Electrolysis.	**8L**
Unit 3	**Illumination:** Various definition, laws of Illumination, requirement of good lighting, Design of indoor lighting & outdoor lighting system. **Refrigeration and Air Conditioning**: Refrigeration system, domestic Refrigerator, water cooler, Types of Air conditioning, Window air conditioner	**8L**
Unit 4	**Electric Traction – I :** Types of electric traction, system of track electrification, Traction mechanics-types of services, speed time curve and its simplification, average and schedule speeds, Tractive effort specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence	**8L**
Unit 5	**Electric Traction – II :** Salient features of traction drives, Series-parallel control of dc traction drives (bridge traction) and energy saving, Power Electronic control of dc & ac traction drives, Diesel electric traction.	**8L**

Text Books:

1. H.Pratab. "Art & Science of Electric Energy's" Dhanpat Rai & Sons.
2. G.K.Dubey," Fundamentals of electric drives" Narosa Publishing house.

Reference Books

1.H.Pratab."Modern electric traction" Dhanpat Rai & Sons.

2.C.L. Wadhwa,"Generation, Distribution and Utilization of Electrical Energy "New Age International Publishers.

Outcome of the Course:

- Have the knowledge of various types of methods used for heating and welding
- A student should be able to select a suitable heating method depending on the types of material to be heated
- Have proper knowledge of different welding methods and electroplating.
- Electroplating and its applications
- A student should be able to design the lighting system for various applications.
- Have understanding of Different types of traction systems particularly electric traction system, types of services and their characteristics

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE345	Subject Title	MODERN CONTROL SYSTEM						
LTP	3 0 2	Credit	4	Subject Category	Elective	Year	3rd	Semester	V

Objectives of the Course

- To study about discrete data systems
- To study state space analysis involving concepts of controllability and observability
- To study different types of stability methods.

Unit 1	**Discrete Data Systems:** Introduction to discrete time systems, sample and hold circuits, pulse transfer function, representation by differential equations and its solution using z-transform and inverse-z transforms, analysis of LTI systems, unit circle concepts.	**8L**
Unit 2	**State Space analysis:** State equations for dynamic systems, State equations using phase, physical and canonical variables, realization of transfer matrices, Solution of state equation, concepts of controllability, observability, Controllability and Observability tests.	**8L**
Unit 3	**Non-linear System & Linearization:** Introduction to non-linear system and their state variable representation. Linearization, describing function of various non-linearities. Stability analysis using describing function.	**8L**
Unit 4	**Stability**: Liapunov's method, generation of Liapunov's function, Popov's criteria, design of state observers and controllers, adaptive control systems, model reference.	**8L**
Unit 5	**Optimal Control**: Introduction , formation of optimal control problems, calculus of variation, minimization of functions, constrained optimization, dynamic programming, performance index , optimality principles, Hamilton – Jacobian equation, linear quadratic problem, Ricatti II equation and its solution, solution of two point boundary value problem	**8L**

Text Books:

1. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
2. M. Gopal, "Modern Control System", Wiley Eastern.
3. Stefani, Shahain, Savant, Hostetter, "Design of feedback control system", oxford university press.

Reference Books

1. B.D.O. Anderson and IB. Moore, " Optimal Control System: Linear Quadratic Methods", Prenctice Hall International.
2. U. Itkis, "Control System of Variable Structure", John Wiley and Sons.
3. H. Kwakemaok and R. Sivan, "Linear Optimal Control System", Wiley Interscience.

Outcome of the Course:

- **Should be able to convert a given system into a state space model**
- **Should be able to check for a given system whether it is controllable and observable or not**
- **Should be able to apply Liapunovs method and popovs methods and optimal control for control of system**

List of Experiments

1. To convert a given system of 2nd order from transfer function model to state space model
2. To convert a 3rd order system from transfer function model to state space model
3. To check the controllability of a given system
4. To check the observabiility of a given system
5. To assess the stability of a 2nd order system using Liapunovs method
6. To assess the stability of a 2nd order system using Popovs method
7. To solve problems based on constrained optimization
8. To solve problems based on two point boundary problems

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE346	Subject Title	WIND AND SOLAR ENERGY SYSTEMS						
LTP	3 0 2	Credit	4	Subject Category	Elective	Year	3rd	Semester	V

Objectives of the Course

- 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 1	**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.	**5L**
Unit 2	**Wind generator topologies**: Review of modern wind turbine technologies,Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent- Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.	**12L**
Unit 3	**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.	**11L**
Unit 4	**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.	**8L**
Unit 5	**Solar thermal power generation:** Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.	**3L**

Text Books:

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.

Reference Books

1. G. N. Tiwari and M. K. Ghosal, "Renewable Energy Applications", Narosa Publications, 2004.
2. J. A. Duffie and W. A. Beckman, "Solar Engineering of Thermal Processes", John Wiley & Sons, 1991.

Outcome of the Course:

- To be able to apply the concepts of renewable energy sources for electricity generation
- To be able to apply the concepts of grid integration with renewable sources
- To evaluate the options and estimate the energy generation through renewable sourceso be able to

List of Experiments **MATLAB based**

1. Analysis of Solar Photovoltaic panel Characteristics
2. Modelling of Solar Array
3. Design and Simulation of Solar PV Model
4. Solar cell modelling and study of characteristics
5. To study modelling of solar power converter
6. To study a grid connected PV array for high power rating
7. To study the effect of change in parameters of wind turbine on power output

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE347	Subject Title	HIGH VOLTAGE ENGINEERING						
LTP	3 1 0	Credit	4	Subject Category	Elective	Year	3rd	Semester	V

Objectives of the Course

- To introduce the basic concepts of high voltage engineering including mechanism of electrical breakdown in gases, liquids and solids,
- To understand high voltage ac/dc and impulse generation and measurement,
- To have knowledge about overvoltage's and their causes, importance of insulation coordination
- To understand measurement of partial discharges and loss tangent, high voltage testing and condition monitoring of power equipment's

Break Down In Gases Ionization processes, Townsend's criterion, breakdown in electronegative gases, time lags for breakdown, streamer theory, Paschen's law, breakdown in non- uniform field, breakdown in vacuum.

Unit 1 **Break Down In Liquid Dielectrics Classification** of liquid dielectric, characteristics of liquid dielectric, breakdown in pure liquid and commercial liquid. **8L**

Break Down In Solid Dielectric Intrinsic breakdown, electromechanical breakdown, breakdown of solid, dielectric in practice, breakdown in composite dielectrics.

Unit 2 **Generation of High Voltage and Currents:** Generation of High direct Current Voltage, Generation of high voltage alternating voltages, generation of impulse voltages generation of impulse currents, tripping and control of impulse generators. **8L**

Unit 3 **Measurement of High Voltage and Currents:** Measurement of High direct Current Voltages, Measurement of High alternating & Impulse voltages, Measurement of High direct, alternating & Impulse Currents, Cathode ray Oscillographs for impulse voltage and current measurements. **8L**

Unit 4 **Over Voltage Phenomenon & insulation Coordination:** Lighting Phenomenon as natural cause for over voltage, over voltage due to switching surges and abnormal conditions, Principal of insulation coordination. **8L**

Non -Destructive Testing Measurement of direct current resistively, measurement of dielectric constant and loss factor, partial discharge measurements.

Unit 5 **High voltage testing:** Testing of insulator & bushing, testing of isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements. **8L**

Text Books:

1. M.S. Naidu & V. Kamraju," High voltage Engineering, Tata Mc-Graw hill.

Reference Books

1. E Kuffel and W.S.Zacngal , High voltage Engineering:, Pergamum Press
2. M.P Churasia, High Voltage Engineering Khanna Publishers.
3. R.S. Jha,"High voltage Engineering", Dhanpat Rai & Sons.
4. C.L. Wadhwa,"High Voltage Engineering", Wiley Eastern Ltd.
5. Subir Ray." An Introduction to High Voltage Engineering" Prentice Hall of India.

Outcome of the Course:

- **To analyse the breakdown mechanisms of electric breakdown in liquids, gases, and solids.**
- **To have understanding of fundamental concepts of high voltage AC, DC, and impulse generation.**
- **To be able to apply techniques for high voltage measurements and non-destructive test techniques in high voltage engineering.**
- **To become familiar with testing and condition monitoring of power equipments.**

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS201	Subject Title	Data Structures						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	2nd	Semester	III

OBJECTIVE:

The objective of this course is familiarizing the students with the different kinds of data structure used for information storage and data retrieval in different applications of computer science.

Unit 1: Introduction to Algorithms & Data Structure (8)

Introduction: Concept of data structure, Types of data structures, Character String in C, Recursion, Structure, Pointer, Dynamic Allocation, Algorithms, Algorithm analysis, Complexity of algorithms and Time space trade-off.

Arrays: Introduction, Single and multi-Dimensional Arrays, address calculation, application of arrays, Operations defined: traversal, insertion and deletion.

Stacks: Stacks, Array representation of stack, Applications of stacks, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack

Unit 2: Queues & Link List (7)

Queue: Queue, Array representation and implementation of queues, Circular queues, Operations on Queue: Create Add, Delete, and Full and Empty, De-Queue, Priority queues, Applications of Queues.

Linked Lists: Concept of linked list, Representation and implementation of singly linked list, Circular linked list, doubly linked list, Operations on Linked lists, Concepts of header linked lists, applications of linked lists.

Unit 3 Trees (8)

Trees: Basic terminologies of trees, Binary tree, Complete Binary tree, Extended Binary tree, Representation of Binary tree, Binary tree traversal, Operations on Binary tree.

Binary Search Tree: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

Unit-4 Graphs (7)

Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Representations of Graphs, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

Unit- 5: Searching, Sorting & File Handling: (9)

Searching &**hashing:** linear search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation

Sorting: Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Heap Sort.

File Handling: Introduction to file handling, Data and Information, File concepts, File organization, files and streams, working with files.

COURSE OUTCOME:

At the end of the course, the student can:

CO1. Students develop knowledge of basic data structures for storage and retrieval of ordered or unordered data. Data structures include: arrays, linked lists, binary trees, heaps, and hash tables.

CO2. Students develop knowledge of applications of data structures including the ability to implement algorithms for the creation, insertion, deletion, searching, and sorting of each data structure.

CO3. Students learn to analyze and compare algorithms for efficiency using Big-O notation.

CO4. Students implement projects requiring the implementation of the above data structures.

TEXT BOOKS

1. Schaum'souline series "Data structures" TMH. 1st Edition Indian Reprint 2014.
2. A. M. Tenenbaum, Langsam, Moshe J. Augentem, Data Structures using C PHI Pub.1st Edition.1998

REFERENCES

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication,2nd Edition. 2008.
2. Robert Kruse, Data Structures and Program Design in C PHI.2nd Edition.2006.
3. Willam J. Collins, Data Structure and the Standard Template library –2003, T.M.H.1st Edition.

SR.NO.	EXPERIMENT NAME
1	Program in C for the implementation of Array for various operations.
2	Program in C for the creation of Stack for its various operation implementation.
3	Program in C for the creation of Queue for its various operation implementation.
4	Program in C for the creation of Link list for its various operation implementation.
5	Program in C for the creation of Circular Link list for its various operation implementation.
6	Program in C for the creation of Doubly Link list for its various operation implementation.
7	Program in C for the creation of Binary Search Tree for its various operation implementation.
8	Program in C for the Implementation of sorting Algorithms.
9	Program in C for the Implementation of basic Graph Algorithms.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS202	Subject Title	Java Programming Concepts						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	2nd	Semester	III

OBJECTIVE:

The objective of this course is familiarizing the students with the concepts of object oriented programming and its implementation in Java programming language.

Unit 1: Object Oriented Programming, Static & Dynamic models (9)

Object Oriented Programming: Objects and classes, generalization and inheritance, aggregation, abstract class.
Static and dynamic models: UML diagrams: Class diagram, interaction diagram: collaboration diagram, sequence diagram, state diagram, activity diagram.

Unit 2: Introduction to Java, Class, Objects (8)

Introduction to Java: Importance and features of Java, Keywords, constants, variables and Data Types, Operators and Expressions.
Branching and looping: if-else, switch, while, do, for statements, jump statements: break, continue, and return.
Introducing classes, objects and methods: defining a class, adding variables and methods, creating objects, constructors, inheritance, overriding, final class, and use of super keyword.

Unit 3 Arrays & Interface in Java (7)

Arrays and Interfaces: Creating an array, string array, dynamic array, abstract classes, interfaces, extending interfaces, IO stream handling, and packages.

Unit-4 Multithreading, Exception handling, Applet and AWT (8)
Multithreading: Thread, thread life cycle, extending thread class, implementing runnable interface, thread synchronization.
Exception handling: inbuilt and user defined exceptions.
Applet and AWT: Introduction to applet, event handling, event classes and listeners, handling images.

Unit- 5: Introduction to Swings (7)

Introduction to Swings: Features of swings, swing UI elements, sample cases developing user interfaces using Swing UI classes, design animation, sound and video application using swings.

COURSE OUTCOME:

At the end of the course, the student can :

CO1. Able to learn Identify classes, objects, members of a class and relationships among them needed for a specific problem.
CO2. Able to learn Java application programs using OOPS principles and proper program structuring.
CO3. Able to Java programs to implement error handling techniques using exception handling.
CO4. Able to GUI programs in java and embed with web pages.

TEXT BOOKS

1. Herbert Schieldt, "The Complete Reference: Java", TMH.9th Edition.2014.
2. E. Balagurusamy, "Programming in JAVA", TMH.5th Edition 2014.

REFERENCES

1. Booch Grady, "Object Oriented Analysis & Design with application 3/e", 3rd Edition Pearson Education, New Delhi,2009.

SR.NO.	EXPERIMENT NAME
1	Program in Java to design simple calculator for (+, -, *, and /) using switch case
2	Program in Java to design accounts class and two functions withdraw() and deposit().
3	Program in Java to show the inheritance in java and use of super keyword..
4	Program in Java to the concept of polymorphism by designing functions to sum different type of numbers
5	Program to show the concept of method overriding in Java.
6	Program in Java that import the user define package and access the Member variable of classes that Contained by Package.
7	Program in C for the creation of Binary Search Tree for its various operation implementation.
8	Program in Java to handle the Exception using try and multiple catch block.
9	Program in Java to create a thread that Implement the Runable interface
10	Program in Java to create Frame that display the student information using awt components
11	Program in Java to create frame for course enquiry using Swings components.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS204	Subject Title	Database Management System						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	2nd	Semester	III

OBJECTIVE:

This course aims to educate students on the role of a well-structured relational database management system (RDBMS) to the efficient functioning of an organization. This course covers theory and practice in designing a relational database management system with example of a current database product of MYSQL. Students also learn about the important concepts of database integrity, security and availability with techniques like normalization, concurrency control and recoverability control.

Unit 1: Introduction to Database System (8)

Introduction: Data base System Applications, data base System VS file System, Data Abstraction, Instances and Schemas, data Models: the ER Model, Relational Model & Other Models , Database Languages, data base Users and Administrator, data base System Structure, Storage Manager, the Query Processor, Two/Three tier architecture.

Unit 2: E-R modeling Data Base Design (7)

E-R model: Basic concepts, Design Issues, Mapping Constraints, Attributes and Entity sets, Relationships and Relationship sets, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

Unit 3 Relational Model & SQL (8)

Relational Model: Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra

SQL: Form of Basic SQL Query, Nested Queries, Aggregative Operators, NULL values, Logical operators, Outer Joins, Complex Integrity Constraints in SQL.

Unit-4 Database Design Concepts (8)

Database Design: Schema refinement, Different anomalies in designing a Database, Decompositions , Problem related to decomposition, Functional Dependency, Normalization using functional dependencies, 1NF, 2NF, 3NF & BCNF , Lossless join decomposition, Dependency preserving Decomposition , Schema refinement in Data base Design, Multi valued Dependencies, 4NF, 5NF.

Unit- 5: Transaction & Concurrency (8)

Transaction Management: Transaction-concepts, states, ACID property, schedule, serializability of schedules, concurrency control techniques - locking, timestamp, deadlock handling, recovery-log based recovery, shadow paging.

COURSE OUTCOME:

At the end of the course, the student will able to learn:

CO1. To work on MySQL database management system.

CO2. To create database and query the database for information retrieval.

CO3. To design a database so that data redundancy, data inconsistency and data loss problems may be resolved.

TEXT BOOKS

1. Raghurama Krishnan, Johannes Gehrke, Data base Management Systems, TATA McGrawHill 3rd Edition,2003
2. Silberschatz, Korth, Data base System Concepts, McGraw hill, 5th edition,2005

REFERENCES

1. Peter Rob & Carlos Coronel, Data base Systems design, Implementation, and Management, 7thEdition,2006.
2. Elmasri Navate, Fundamentals of Database Systems, Pearson Education,7th edition 2016
3. C.J.Date ,Introduction to Database Systems, Pearson Education,8th edition,2012

SR.NO.	EXPERIMENT NAME
1	Implementation of Data Definition language in Query Language.
2	Implementation of Data Manipulation in Query Language.
3	Insertion & Updation of records in Database table
4	Implementation of GROUP functions (avg, count, max, min, Sum).
5	Execution of the various type of SET OPERATORS (Union, Intersect, Minus).
6	Apply the various types of Integrity Constraints on table.
7	Creation of various types of JOINS.
8	Implementation of Views and Indices in database.
9	Implementation of foreign key on database.
10	Modify the database structure and drop the record with structure.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS211	Subject Title	Discrete Mathematics						
LTP	3 1 0	Credit	4	Subject Category	DC	Year	2nd	Semester	III

Objective:

The objectives of this course is to learn concepts of Discrete Mathematics and by applying the algorithms to solve the problems related to Recursion , combinatorial mathematics and problems on basic graph theory.

UNIT I: Unit 1: Introduction to Sets, Relations & Functions (7)

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs, Set Identities.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.
Natural Numbers: Introduction, Mathematical Induction.

UNIT II: Unit 2: Posets & Introduction to Boolean algebra (6)

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.
Lattices: Definition, Properties of lattices – Bounded, Complemented and Complete Lattice
Boolean algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions.

UNIT III: Groups & Rings (8)

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups Permutation and Symmetric groups, Group Homeomorphisms, Definition and elementary properties of Rings and Fields, Integers modulo n.

UNIT IV: Propositional logic, Predicate Logic & Introduction to Probability (8)

Propositional Logic: Proposition, well-formed formula, Truth tables, Tautology, Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.
Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic.
Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle
Probability: Introduction, Conditional Probability & Independence

UNIT V:Introduction to Graphs & Recurrence Relations (7)

Graphs: Definition and terminology, Representation of graphs, multigraphs, bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring.
Trees: Definition, Binary tree, Binary tree traversal, binary search tree.
Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences

Course Outcomes:

- An ability to perform operations on discrete structures such as sets, functions, relations, and sequences..
- An ability to construct proofs using direct proof, proof by contradiction, proof by cases, and mathematical induction.
- An ability to demonstrate the ability to solve problems using counting techniques and combinatorics in the context of discrete probability.
- An ability to solve problems involving recurrence relations and generating functions.

- An ability to prove computational theorem

Text Books:

1. Liu C.L., Elements of Discrete Mathematics, McGraw Hill Int. 4th edition2012.
2. Kolman B & Busby C.R., Discrete Mathematical Structure for Computer Science, Prentice Hall of India Ltd. 6th Edition 2008.
3. Deo N., Graph Theory, Prentice Hall of India.4th edition 2014.

Reference Books:

1. Trembley J.P. &Manohar R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill.1st Indian Edition 2001.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS301	Subject Title	ALGORITHMS: ANALYSIS & DESIGN						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	3rd	Semester	V

OBJECTIVE:

This course aims to provide the knowledge and understanding the complexity issues of algorithms

1. To introduce algorithms analysis and design techniques
2. To understand and design of algorithms used for searching, sorting, indexing operation

Unit-I **(6 L)**

Introduction: Algorithms, Performance Analysis: Space and Time Complexity, Asymptotic Notations- Big Oh, Omega, theta notations, finding complexity of the algorithm, Linear Sorting: Insertion sort, Bubble sort, selection sort.

Unit –II **(8 L)**

Advanced Data structures: B-Tree, Binomial Heaps, Fibonacci Heaps, Red & Black Tree.

Divide and Conquer: General method, binary search, quick sort, merge sort, heap sort,

Unit –III **(8 L)**

Greedy Method: General method, Activity Selection, job scheduling with deadlines, fractional knapsack problem, Minimum cost spanning tree: Kruskal's and Prim's, single source shortest path, Huffman tree.

Amortized analysis

Unit – IV **(8 L)**

Dynamic Programming: General Method, 0-1 Knapsack, Matrix chain multiplication, longest subsequence, all pair shortest paths,

Backtracking- Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

Unit –V **(6 L)**

Branch and Bound: Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

NP-Hard and NP-Complete problems: Basic Concepts, non-deterministic algorithms, NP-Hard and NP-Complete classes, Cooks Theorem.

LEARNING OUTCOMES

CO1. Analyzing complexity issues of algorithms
CO2. Ability in using the appropriate algorithm for searching, sorting, indexing operations
CO3. Designing of new algorithms
CO4. Student will be able to learn NP Class problems.

Text Books:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Pvt. Ltd., 2012.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2003.
3. M.T.Goodrich and R.Tomassia, Algorithm Design: Foundations, Analysis and Internet examples, Johnwiley and sons.

Reference Books:

1. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Introduction to Design and Analysis of Algorithms A strategic approach, McGraw-Hill Education (Asia) ,2005
2. Aho, Ullman and Hopcroft ,Design and Analysis of algorithms, Pearson Education India; 1st edition 2002
3. Ellis Horowitz, Satraj Sahni and Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publications pvt. Ltd.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS343	Subject Title	Advanced Concepts in OOPs *(Departmental Elective 1/2)*						
LTP	3 0 2	Credit	4	Subject Category	DE	Year	3rd	Semester	V

OBJECTIVES:

1. To understand the Object-based view of Systems
2. To develop robust object-based models for Systems
3. To inculcate necessary skills to handle complexity in software design.

UNIT 1 **(6 L)**

J2SE: Concepts and Prerequisites: Data Types, Arrays, Dynamic Arrays, Type Casting, Classes and Objects, Inheritance, Interfaces, Exception Handling, Multi-Threading.

J2EE Architecture: J2EE as a framework, Client Server Traditional model, Comparison amongst 2-tier, 3-tier and N-tier architectures.

UNIT 2 **(8 L)**

JDBC: Introduction, JDBC Architecture, Types of JDBC Drivers, The Connectivity Model, The java.sql package, Navigating the Result Set object's contents, Manipulating records of a Result Set object through User Interface , The JDBC Exception classes, Database Connectivity, Data Manipulation (using Prepared Statements, Joins, Transactions, Stored Procedures).

UNIT 3 **(8 L)**

Java Beans: The software component assembly model- The java beans development kit- developing beans JAR files-Introspection-Bound Properties-Persistence-customizers - java beans API. EJB: EJB architecture- EJB requirements –EJB session beans- EJB entity beans-EJB Clients.

UNIT 4 **(6 L)**

Java Servlet: Servlet overview, Brief origin and advantages over CGI, Writing small Servlet Programs, Deployment Descriptor, Servlet Life Cycle, Sharing Information, Initializing a Servlet, Writing Service Methods, Filtering Requests and Responses, Invoking Other Web Resources, Accessing the Web Context, Maintaining Client State, Finalizing a Servlet, Session: Definition, Different ways to track sessions.

UNIT 5 **(8 L)**

JSP: Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit JSP objects, Conditional Processing, Declaring variables and methods, Error Handling and Debugging, Sharing data between JSP pages-Sharing Session and Application Data. Accessing a database from a JSP page, Application-specific Database Action, Developing Java Beans in a JSP page, introduction to Struts framework.

LEARNING OUTCOMES

After the completion of the course students will able to learn

CO1. Ability to analyze and model software specifications.

CO2. Ability to abstract object-based views for generic software systems.

CO3. Ability to deliver robust software components.

CO4. The student will be able to design projects using Advance concepts of OOPs.

Text Book:

1. J. McGovern, R. Adatia,Y. Fain, J2EE 1.4 Bible, Wiley-dream tech India Pvt. Ltd, New Delhi, 2003.
2. H. Schildt, 2002, Java 2 Complete Reference, 5th Edition, Tata McGraw-Hill, New Delhi.

Reference Book:

1. K. Moss, Java Servlets, Second edition, Tata McGraw Hill, New Delhi, 1999
2. D. R. Callaway, Inside Servlets, Addison Wesley, Boston, 1999.
3. Joseph O'Neil, Java Beans from the Ground Up, Tata McGraw Hill, New Delhi, 1998.
4. Tom Valesky, Enterprise JavaBeans, Addison Wesley.
5. Cay S Horstmann & Gary Cornell, Core Java Vol II Advanced Features, Addison Wesley

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS344	Subject Title	Introduction to Cloud Technologies *(Departmental Elective 1/2)*						
LTP	3 0 2	Credit	4	Subject Category	DE	Year	3rd	Semester	V

OBJECTIVES:

The objective of this course is to study in-depth understanding of various aspects of cloud computing and be able to implement cloud services in an effective manner cloud Technologies.

Unit I (6 L)

Overview of cloud computing : What is a cloud, Definition of cloud , Definition of cloud ,characteristics of cloud ,Why use clouds, How clouds are changing , How clouds are changing , Driving factors towards cloud, Comparing grid with cloud and other computing systems, workload patterns for the cloud, "Big Data", IT as a service.

Unit II (8 L)

Cloud computing concepts: Concepts of cloud computing, Cloud computing leverages the Internet, Positioning cloud to a grid infrastructure, Elasticity and scalability, Virtualization, Characteristics of virtualization, Benefits of virtualization, Virtualization in cloud computing, Hypervisors, Multitenancy, Types of tenancy, Application programming interfaces (API), Billing and metering of services , Economies of scale, Management, tooling, and automation in cloud computing, Management: Desktops in the Cloud, Security.

Unit III (8 L)

Cloud service delivery: Cloud service , Cloud service model architectures, Infrastructure as a service (IaaS) architecture, Infrastructure as a service (IaaS) details, Platform as a service (PaaS) architecture, Platform as a service (PaaS) details, Platform as a service (PaaS) , Examples of PaaS software, Software as a service (SaaS) architecture, Software as a service (SaaS) details, Examples of SaaS applications, Trade-off in cost to install versus ,Common cloud management platform reference architecture: Architecture overview diagram, Common cloud management platform.

Unit IV (6 L)

Cloud deployment scenarios: Cloud deployment models, Public clouds, Hybrid clouds, Community, Virtual private clouds, Vertical and special purpose, Migration paths for cloud, Selection criteria for cloud deployment.

Unit V (8 L)

Cloud computing Security : Cloud security reference model, How security gets integrated , Cloud security , Understanding security risks, Principal security dangers to cloud computing, Virtualization and multitenancy, Internal security breaches, Data corruption or loss, User account and service hijacking, Steps to reduce cloud security breaches, Steps to reduce cloud security breaches, Reducing cloud security, Identity management: Detection and forensics, Identity management: Detection and Identity management, Benefits of identity, Encryption techniques, Encryption & Encrypting data , Symmetric key encryption, Asymmetric key encryption, Digital signature, What is SSL? IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform, A comparison of Cloud Computing Platforms, Common building Blocks.

LEARNING OUTCOMES

At the end of course the students will able to learn:

CO1. Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures. Design different workflows according to requirements and apply map reduce programming model.

CO2. Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.

CO3. Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds

CO4:.Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application .

Text Book:

1. R. Buyya, C. Vecchiola, S. T. Selvi, Matering Cloud Computing, Ed. Third reprint, 2013
2. B. Sosinsky, Cloud computing Bible, Ed. Reprint Willy India Pvt. Ltd, 2014,

Reference Book:

1. M. Miller, Cloud Computing, Pearson education in South Asia, Ed. 9th 2014.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Humanities Electives II

Subject Code	HS384	Subject Title	Principles of Management						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	III	Semester	V

Course Objective

- The objective of this course is to familiarize B.Tech. Students with the roles, responsibilities, and skills required of modern managers.
- This course will be present the concepts of management as it applies to current thinking in the workplace.

Unit 1 Overview of management **5 Hrs.**

Definition-Management-Role of managers-Organization and the internal and environmental factors –Trends and Challenges of Management in India.

Directing – delegation –span of control– communication, Controlling

Unit 2 Management Information **4 Hrs.**

Introduction to functional areas of management, Operations management, Human resources management, Marketing management, Financial management

Unit 3 Planning Approach to Organizational Analysis **10 Hrs.**

Design of organization structure; job design and enrichment; job evaluation and merit rating

Unit 4 Motivation and Productivity **7 Hrs.**

Theories of motivation, Leadership styles and Managerial grid. Co-ordination, monitoring and control in organizations. Techniques of control; Few Cases on current management issues in India

COURSE OUTCOME:

- To present the topics in management, management theories, while at the same time focusing on practical applications in the real world especially for engineers.
- Evaluate the global context for taking managerial actions of planning, organizing and controlling.
- Assess global situation, including opportunities and threats that will impact management of an organization.
- Integrate management principles into management practices.

TEXT BOOKS:

1. Schermerhorn, Management and Organisational Behaviour essentials, Wiley India
2. Koontz: Essentials of Management, PHI Learning.
3. Hirschey: Managerial Economics, Cengage Learning.
4. A V Rau: Management Science, BSP, Hyderabad
5. Mote, l Paul and Gupta: Managerial Economics Concepts & Cases, TMH, New Delhi.
6. Stephan R Robbins Fundamental of Management, Pearson

REFERENCE BOOKS

- Koontz, H., and Weihrich, H., Essentials of Management: An International Perspective, 8th ed., McGraw Hill, 2009.
- Hicks, Management: Concepts and Applications, Cengage Learning, 2007.
- Mahadevan, B., Operations Management, Theory and Practice, Pearson Education Asia, 2009
- Kotler, P., Keller, K.L, Koshy, A., and Jha, M., Marketing Management, 13th ed., 2009.
- Khan, M.Y., and Jain, P.K., Financial Management, Tata-Mcgraw Hill, 2008.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Humanities Electives II

Subject Code	HS391	Subject Title	Positive Psychology & Living						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	III	Semester	V

Course Objective

- To increase awareness for relevance of positive emotions at workplace.
- To equip students with psychological skills to maximize happiness and virtues like compassion, love and wisdom through experiential, workshop based and interactive activities along with assigned lectures and reading

Unit 1 What is positive psychology? 7Hrs.

Introducing Positive Psychology: Definition, goals, assumptions, key concepts and relationships with health psychology, developmental psychology, social psychology and psychology of religion, Meaning and measure of Happiness: Hedonic and Eudemonic perspective, Yogic notion of bliss

Unit 2 Positive Emotions, Cognitive states and Well-being 9Hrs.

What are positive emotions? The broaden and build theory, relevance of positive emotional states for physical, social & psychological resources, Positive emotions and well-being: Happiness and positive behavior, positive emotions and success, resilience, Self-efficacy, Optimism, Hope, Wisdom, Mindfulness and flourishing

Unit 3 How to enhance well-being? 5Hrs.

Use of postures, breathing practices, Sounds, dietary consumption

Unit 4 Positive Psychology at work place 5Hrs.

Maximizing achievement, conflict resolution, gratitude, positive leadership

COURSE OUTCOME:

- Students learn about modern psychological knowledge of happiness.
- Students acquire skills to cultivate positive emotions.
- Measure and build individual, workplace and educational flourishing; plan, implement and assess positive psychology.
- Students will gain an understanding of what contributes to well-being and how to build the enabling conditions of a life worth living.

TEXT BOOK:

Snyder (2011). Positive Psychology: The Scientific and Practical Explorations of Human Strengths. New Delhi: Sage.

REFERENCE BOOKS:

1. Carr, A. (2004). Positive Psychology: The science of happiness and human strength.UK: Routledge.
2. Peterson, C. (2006). A Primer in Positive Psychology. New York: Oxford University Press.
3. Seligman, M.E.P. (2002). Authentic Happiness: Using the New Positive Psychology to Realize YourPotential for Lasting Fulfillment. New York: Free Press/Simon and Schuster.
4. Snyder, C.R., &Lopez,S.J.(2007). Positive psychology: The scientific and practical explorations of human strengths. Thousand Oaks, CA: Sage.
5. Snyder, C. R., & Lopez, S. (Eds.). (2002). Handbook of positive psychology. New York: Oxford University Press.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Humanities Electives II

Subject Code	HS385	Subject Title	Engineering Economics						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	III	Semester	V

Course Objective:

- To provide the basic overview of economics in engineering perspectives.
- To increase the understanding of students to solve the engineering problems through economic theories.
- To increase the understanding of students to use economics theories in project investment of industries

Unit 1 General Overview of Economics **6Hrs.**

Nature and Scope of Economics in engineering perspective; **Theory of Demand Analysis:** Meaning and Types, Law of demand, Exceptions to the Law of Demand, Elasticity of Demand; **Theory of Supply Analysis:** Law of Supply and Elasticity of Supply; Mathematical Explanation on cost, revenue and profit function

Unit 2 Production Function and Its Applications **6Hrs.**

Production Function: Short-run and long-run Production Function; **Mathematical Explanation:** Laws of Returns to Scale & Law of Diminishing Returns Scale; **Concept of Cost and Its Types:** Total cost, fixed cost, variable cost, average variable cost, average fixed cost, marginal cost, explicit and implicit cost; **Break-Even-Analysis:** Importance and graphical presentation, mathematical problems

Unit 3 Time Value of Money and Project Evaluation **8Hrs.**

Time Value of Money: Simple and Compound, Uniform Series Compound Interest Formula, Present Worth Analysis, Future Worth Analysis, Future Value through Annuity, Rate of Return Analysis, Cash flow diagrams; **Depreciation**: Introduction, Straight Line and Declining Balance Method of Depreciation; **Project Evaluation Techniques:** Present Worth Method, Future Worth Method, Annual Worth Method; Benefit Cost Analysis: Conventional and Modified B/C Ratio with PW method

Unit 4 Banking and Finance **6 Hrs.**

Banking Sector: Functions of the Commercial Bank and Central Bank, Financial Institutions; **Financial Market:** Money Market and Capital Market; **Monetary and Fiscal Policy:** Objectives, Instruments, Tools in Indian Economy; **Inflation:**Causes, Effects and Methods to Control it, Measurement of Inflation- Consumer Price Index and Whole Price Index; Deflation and Stagflation; **Business Cycles:** Various phases, Control and Measurement, Impact on business cycles on economic activities

COURSE OUTCOME

- Students will be able to apply economic principles and calculations to solve engineering projects.
- To students will be efficient to get the idea of production activities and its applications in industries.
- Students will be competent to estimate the present and future value of money on their various investment plans.
- Develop the ability to account for time value of money using engineering economy factors and formulas, as well as the implications and importance of considering taxes, depreciation, and inflation.

TEXT BOOKS TEXT BOOKS

1. Pravin Kumar (2015). Fundamental of Engineering Economics. Raj Kamal Press, New Delhi.
2. Riggs J.L., Dedworth, Bedworth D.B., and Randhawa, S.U. (1996). Engineering Economics. McGraw Hill International, New Delhi
3. PanneerSelvam R. (2001). Engineering Economics. Prentice Hall of India Ltd, New Delhi.

REFERENCE BOOK

- L.M. Bhole (2007). Financial Institutions and Markets. Tata McGraw Hill, New Delhi.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Humanities Electives II

Subject Code	HS382	Subject Title	Literature, Language & Society						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	III	Semester	V

Course Objective

- The focus of the programme is on the interaction between literature & Society, and Literature and visual culture
- To discuss how Literature reacts to major changes in society

Unit 1 **4Hrs.**

Nature and Functions of Literature, Literature and Society with special reference to Indian Literature and Indian Society, Literary Forms, Poetry, Drama, Fiction, Essay, Autobiography

Unit 2 **7Hrs.**

Approaches to the Study of Literature, Reader response to the study of Literature, Interpretation, Appreciation, Evaluation, Special problems in understanding Modern Literature.

Unit 3 **9Hrs.**

Social dimension of language. problems of multilingual communities, dominance and conflict, shift and attrition, language and the state, language and nation, Indian multilingualism, language variation, language and identity, linguistic prejudice and inequality, standardization, linguistic determinism, critical discourse analysis, and methodological issues.

Unit 4 TEXT **6 Hrs.**

Jerome K Jerome: Three Men on a Bummel (selection), Martin Amis: Last Days of Muhammad Atta, Li Ho: A Girl Comb her hair, R.K. Narayan: Malgudi Days (selection)

COURSE OUTCOME

- Students will read critically from a variety of genres, specifically poetry, drama, non fiction, and fiction.
- Students will read literature more carefully and meaningfully, practicing close-reading skills.
- Students will understand the relation between historical and cultural contexts.
- The students will develop a critical understanding of how literature can both uphold and resist existing structures of power.

TEXT BOOKS

1. Jerome K Jerome: Three Men on a Bummel (selection), Arrow smith Publications
2. R.K. Narayan: Malgudi Days (selection), I*ndian Thought Publications*

REFERENCE BOOKS

- Martin Montgomery, An Introduction to Language and Society (Studies in Culture and Communication)Routledge; 2 edition (December 22, 1995)
- Robe Pope, *An Introduction to Language Literature and Culture*.Routledge, 2005

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	HS301	Subject Title	APTITUDE & SOFT SKILLS III					
LTP	3 0 0	Credit	0	Subject Category	AC	Year	III	Semester	V

Course Outline: The first step of an intensive two step placement training module equips the students to successfully handle the placement program of any on-campus/off-campus company. It not only provides career guidance about the selection process but also helps students in profile building; self-introduction and proactive internship search techniques.

Course Objective:

1. Interpret the questions of aptitude building objectively and prepare for various competitive examinations
2. Understand the optimized approach of dealing with placement questions
3. Learn ways of representing themselves effectively in formal settings

Course Pre / Co-requisite (if any): Understanding of writing concepts, general intelligence of LR, algebra concepts and equation formation, time management and presentation skills covered in Aptitude and Soft Skills I and II.

Detailed Syllabus

UNIT 1 - QUANTITATIVE APTITUDE 11 HOURS

Number System 03 hours

Types of numbers; Factors; Divisibility test; Place and face Value; Base system; Remainder theorem; digits at the unit places and finding last two digits in a given expression; Calculating number of zeroes, Finding maximum power of any prime number or any composite number in any factorial, HCF and LCM.

Fractions–Types of fractions; Conversion of terminating and non-terminating types of decimal into fraction; Subtraction, addition and multiplication of terminating and non-terminating decimals.

Percentage 02 hours

Basic concepts; Conversion from fraction to percentage; Application of percentage in – Expenditure, Cost, Consumption problems; Population increase or decrease problems; Production, Manpower and Working hour problems; successive increment or decrement; Comparison of salary or numbers; Percentage change in area or volume, etc.

Ratio and Proportion 02 hours

Ratio, Proportion and Variation:Ratio- Introduction; Types of ratios; Comparison of Ratios; Concept of duplicate, triplicate, sub-duplicate and sub-triplicate ratios.

Proportion and variation – Concept of direct, inverse, continuous and mean proportions.

Profit and Loss 02 hours

Introduction; Concept of single, double and triple discount and marked price.

Simple / Compound Interest 02 hours

Simple Interest and compound Interest: Basic concept of Principal, Time, Amount and Rate of Interest; Concept of Lent money.

UNIT 2- VERBAL APTITUDE 09 HOURS

Tenses 02 hours

Understanding and aligning them with the various question types.

Subject – Verb Agreement 02 hours

Subject-Verb Agreement: Rules and Applications; commonly confused words-II; Gerunds, Active and Passive voice.

Question Types **03 hours** Introduction to Question types-I: Fill in the blanks, One word Substitution, Spellings, understanding the right word choice, concept of para jumbles and para completion, reading comprehension, verbal analogies, odd man out, phrases and idioms.
Introduction to Question types-II: Error identification, Homophones, Usage of the various figures of speech, commonly confused words and phrases, techniques for tackling synonyms and antonyms.

Reading Comprehensions **02 hours** Reading Comprehension: Basics of Comprehensions, different tones of comprehensions, cracking question types like contextual vocabulary, fill in the blanks, true/false questions, reference to context, summary and title of the passage, paraphrasing the text.

UNIT 3- LOGICAL REASONING **10 HOURS**

Coding Decoding and Sequences **02 hours**
Coding Decoding, Cryptarithmetic, Sequence and Series - Finding the missing term/wrong term in the logical sequence of letter/number/word/alphanumeric, Continuous pattern series.

Verbal Analogies and Odd man out **02 hours**
Verbal Analogy based on various parameters - Antonym / synonym relationship, Quantity and unit, Individual and Group, Product and Raw material, cause and Effect etc.
Odd man out based on several kind of relationship – Relationship based on meaning, functional relationship, even- odd or prime-composite, divisibility rule, etc.

Blood Relation and Direction Sense **02 hours** Blood Relation- Indicating form / puzzle form / coding form, Direction Sense, Direction puzzles.

Seating Arrangements **02 hours** Seating Arrangements – Linear / Circular / Distribution / comparison/ Floor and box arrangement /Quant based arrangements/ etc.

Critical Reasoning– I **02 hours**
Statement and assumptions, course of action, statement and conclusion, probably true/false.

UNIT 4- NON VERBAL COMMUNICATION **04 HOURS**

Types of Non Verbal Communication, Body Language-Exercises and Activities, Error Analysis & Feedback Sharing.
Suggested Activities & Exercises: (i) Communication Origami, (ii) Power of body language, (iii) Draw it.

UNIT 5- ONLINE PROFILING & SOCIAL MEDIA ETHICS **05 HOURS**

Social Media ethics and etiquette, Do's & Don'ts, LinkedIn Profile Development, Example Sharing, Feedback Sharing & Error Analysis.
Suggested Activities & Exercises: (i) Online Portfolio Creation, (ii) Fun Social Media Projects,
(iii) LinkedIn profile development project with feedback sharing and error analysis

LEARNING OUTCOME:

By the end of this semester, students will be able to perceive and analyse the requirements of placement trends as detailed information about the selection process would be provided by career guidance. They will be more confident and will be able to develop a professional profile, both online and offline.

Text book [TB]:

1. Quantitative Ability:How to prepare for Quantitative Aptitude, Arun Sharma, McGraw Hill, 8th edition-2018.

2. Logical Reasoning**:** A Modern Approach to Logical Reasoning-R.S. Aggarwal S Chand Publishing; 2nd Colour edition-2018.
3. Verbal Aptitude: English is Easy- Chetanand Singh, BSC Publication-2018.
4. Soft Skills: The Definitive Book of Body Language by Barbara and Allan Pease; RHUS; 1 edition-2006.

Reference books [RB]:

1. QA :Quantitative Aptitude for Competitive Examinations- R.S. Agarwal S. Chand Publications-2017.
   QA: Quantitative Aptitude- Saurabh Rawat and Anushree Sah Rawat, Savera Publishing House, 1st Edition-2016.
2. LR: Logical Reasoning and Data Interpretation for the CAT - Nishit K Sinha, Pearson India; 5th edition-2016.
   LR: Wiley's Verbal Ability and Reasoning - P A ANAND,Wiley-2016.
3. VA : Oxford Guide to English Grammar- John Eastwood, Oxford University Press-2003.
   VA: Fun with grammar- Suzanne W. Woodward Pearson Education ESL-1996
4. Soft Skills :How to Talk to Anyone by Leil Lowndes Harper Element; New edition-2015.
   Soft Skills: Crucial Conversations: Tools for Talking When Stakes Are High by Kerry Patterson, Joseph Grenny, Ron McMillan, and Al Switzler; Brilliance Audio; Abridged, Updated edition-2013.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE303	Subject Title	POWER ELECTRONICS						
LTP	3 0 2	Credit	4	Subject Category	Univ. Core	Year	3rd	Semester	VI

Objectives of the Course

- To introduce the basic concepts of power electronics,
- To introduce types of converters, their characteristics, turn-on of SCR, gate characteristics,
- To know about AC-DC Converters, DC - DC Converters, AC-AC and DC-AC Converters.

Unit 1	**Power semiconductor Devices**: Power semiconductor devices their symbols and static characteristics; Characteristics and specifications of switches, types of power electronic circuits. Thyristor – Operation V- I characteristics, two transistor model; Triacs, GTOs, MOSFETs and IGBTs - static characteristics and principles of operation	**8L**
Unit 2	**Power Semiconductor Devices (Contd):** Protection of devices; Series and parallel operation of thyristors; Commutation techniques of thyristor DC-DC Converters: Principles of step-down and step-up chopper and their operation with R-L load; Classification of choppers	**8L**
Unit 3	P**hase Controlled Converters**: Single phase half wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode; Single phase fully controlled and half controlled bridge converters; Three phase half wave converters, three phase fully controlled and half controlled bridge converters; Effect of source impedance; Single phase and three phase dual converters.	**8L**
Unit 4	**AC Voltage Controllers:** Principle of On-Off and phase controls; Single phase ac voltage controller with resistive and inductive loads; Three phase ac voltage controllers (various configurations and comparison) Cyclo Converters: Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation	**8L**
Unit 5	**Inverters:** Single phase series resonant inverter; Single phase bridge inverters Three phase bridge inverters: 1200 and 1800 mode of operation; Voltage control of inverters; Harmonics reduction techniques; Single phase and three phase current source inverters.	**8L**

Text Books:

1. M.H. Rashid, "Power Electronics: Circuits, Devices & Applications", Prentice Hall of India Ltd. 3rd Edition, 2004.
2. P.S.Bimbhra, "Power Electronics" Khanna Publication.
3. Umanand "Power Electronics" Wiley India.

Reference Books

1. P.C. SEn, "Power Electronics", Mc Graw Hill
2. Dragan Maksimović and Robert Warren Erickson, "Fundamentals of Power Electronics", Springer

Outcome of the Course:

- **Articulate the basics of power electronic devices**
- **Express the design and control of rectifiers, inverters.**
- **Design of power electronic converters in power control applications**
- **Ability to express characteristics of SCR, BJT, MOSFET and IGBT.**
- **Ability to express communication methods.**
- **Ability design AC voltage controller and Cyclo-Converter.**
-

List of Experiments

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without

freewheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
6. To study single-phase ac voltage regulator with resistive and inductive loads.
7. To study single phase cyclo-converter
8. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
9. To study operation of IGBT/MOSFET chopper circuit
10. To study MOSFET/IGBT based single-phase series-resonant inverter.
11. To study MOSFET/IGBT based single-phase bridge inverter.

Software based experiments (PSPICE/MATLAB)
12. To obtain simulation of SCR and GTO thyristor.
13. To obtain simulation of Power Transistor and IGBT.
15. To obtain simulation of single phase full wave ac voltage controller and draw load voltage and load current waveforms for inductive load.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE304	Subject Title	POWER SYSTEM ANALYSIS						
LTP	3 0 2	Credit	4	Subject Category	Univ. Core	Year	3rd	Semester	VI

Objectives of the Course

- To introduce the concepts of Load flow analysis, bus impedance/admittance matrix,
- To introduce load flow problem formulation and solution techniques,
- To introduce fault analysis, steady state and transient stability analysis, load frequency and voltage control and different type of distribution systems.

Unit 1	**Introduction:** Representation of power system components like synchronous machine, transformer, transmission line. One line diagram, Impedance and Reactance diagram, per unit system of calculation, Brief description of power system components like synchronous machine, transformer, busbar, transmission line and isolators.	**8L**
Unit 2	**Load Flow Analysis:** Bus classifications, Formation of bus admittance matrix by singular transformation, Formation of load flow problem, Gauss – Siedel and Newton – Raphson method of load flow analysis, Approximation of Newton – Raphson load flow analysis, Fast decoupled method.	**8L**
Unit 3	**Fault analysis:** Types of fault – shunt and series, Calculation of fault current and voltages for symmetrical short circuit, Symmetrical components, Sequence impedance, Unsymmetrical short circuits, Open conductor fault, Current limiting reactors	**8L**
Unit 4	**Stability Analysis:** Introduction to steady state and transient Stability of power systems, Swing equation, Equal area criteria, Solution of swing equation, Methods of improving stability	**8L**
Unit 5	**Distribution System & Substations:** Different types of distribution systems, Distribution from one and both ends, Ring mains, Unbalanced loading, 3 phase 4 wire and 3 phase 5 wire distribution system, Layout of distribution substation, Rural electrification and grounding.	**8L**

Text Books:

1.W.D. Stevenson, "Element of Power System Analysis", McGraw Hill, USA
2.C.L. Wadhwa, "Electrical Power Systems", New Age International Ltd., Third Edition
3.Ashfaq Husain, "Power System", CBS Publishers & Distributors, India
4.B.R. Gupta, "Power System Analysis & Design", S.Chand & Co, Third Edition
5.M.V. Deshpande, " Electrical Power System Design", Tata McGraw Hill

Reference Books

1.Soni, Gupta & Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & Sons, India
2.S.L. Uppal, " Electric Power", Khanna Publishers
3.S.N. Singh, "Electric Power Generation, Transmission & Distribution", PHI, New Delhi

Outcome of the Course:

- **Solve load flow problems using per unit values systems.**
- **Develop power system network models.**
- **Formulate and solve load flow problems using various techniques as per the requirements of complexity, computational time and accuracy.**
- **Calculate power losses in power system and develop economical power system operation scheme.**

List of Experiments **MATLAB Based**

1. Computation of Parameters and Modeling of Transmission Lines
2. Formation of Bus Admittance and Impedance Matrices
3. Solution of load flow and related problems using Gauss- Seidel Method.
4. Solution of load flow and related problems using Newton Raphson Method
5. Fault Analysis
6. Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System
7. Transient Stability Analysis of Multi machine Power Systems
8. Electromagnetic Transients in Power Systems

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EC352	Subject Title	BIO-MEDICAL INSTRUMENTATION						
LTP	3 0 2	Credit	4	Subject Category	Electives	Year	3rd	Semester	VI

Objectives of the Course

- Requirement of bio-medical and its application
- Concept of bio-potential electrodes and measurements related to them.
- Concepts of bio-transducers and measurements related to them.
- Concept of bio-medical instruments and their uses.

Unit 1	**ANATOMY AND PHYSIOLOGY:** Basic Cell Functions, Origin of Bio-potentials, Electrical Activity of Cells, components of man Instrument system, types of bio-medical stems, design factors and limitations of biomedical instruments, terms and transducers to various physiological events.	**8L**
Unit 2	**BIO-POTENTIAL ELECTRODE:** Types of bio-potential electrodes., Electrode-Electrolyte interface, half cell potential, Polarization- polarisable and non-polarisable electrodes, Ag/AgCl electrodes, Electrode circuit model; Electrode and Skin interface and motion artifact. Body surface recording electrodes for ECG, EMG, EEG. Electrodes standards.	**8L**
Unit 3	**BIO-TRANSDUCER:** Transduction Principles: Resistive Transducers Strain Gauge- types, construction, selection materials, Gauge factor, Bridge circuit, Temperature compensation. Strain Gauge type Blood pressure transducers. Thermo resistive transducer, Inductive Transducers, Capacitive Transducer Piezoelectric Transducer Bio potential Measurement.	**8L**
Unit 4	**BIOMEDICAL INSTRUMENTATION CARDIAC MEASUREMENT:** Cardiovascular System, Heart Structure, Cardiac Cycle, ECG Theory, ECG Electrodes, Electrocardiograph, Indicator dilution methods; Measurement of continuous Cardiac output derived from aortic pressure waveforms, cardiac Arrhythmias; Phonocardiogram, Measurement of heart rate, Blood pressure, Temperature, Respiration rate, Blood Flow meters.	**8L**
Unit 5	**BIOTELEMETRY AND ELECTRICAL SAFETY:** Bio-telemetry design, single channel bio telemetry transmitter and receiver system based on AM, FM and, pulse modulation. Significance of Electrical Danger, physiological effect of current, ground shock Hazards.	**8L**

Text Books:

1.Joseph J. Carr & John. M. Brown, 'Introduction to Biomedical Equipment technology'

2.R.S. Khandpur, 'Handbook of Biomedical Instrumentation', McGraw Hill.

Reference Books

1.J.G. Webster, 'Medical instrumentation application and design', Houghton Miffin Co., Boston USA.

2.Mohan Murali H, 'Monograph on Biomedical engineering', O.U. Press 1985.

Outcome of the Course:

The course provides an understanding of:

- **Bio-medical instruments and measurements.**
- **Principle of working of bio-medical transducers.**
- **Skills to use modern bio-medical tools and equipment for measurements related to human body.**

List of Experiments

1. Pulse measurement
2. Heartbeat measurement
3. Automatic BP measurement
4. Heart sound study using electronics stethoscope

5. ECG measurement

Following experiments to be done on the breadboard

6. Design of low noise and low frequency amplifier for biomedical application
7. Design of Instrumentation amplifier
8. Construction of chopper amplifier

Two Value Added Experiments to be added by Instructor.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE348	Subject Title	ELECTRICAL MACHINE DESIGN						
LTP	3 0 2	Credit	4	Subject Category	Electives	Year	3rd	Semester	VI

Objectives of the Course

- To study and design the transformers and analyze them
- To study and design the induction motors
- To study and design the synchronous machines and dc machines

Unit 1	**INTRODUCTION** Standards & standardization, Classification of insulating materials. Modes of heat dissipation & temperature rise-time curves. Methods of cooling ventilation (induced & forced, radial & axial), direct cooling & quantity of cooling medium.	**8L**
Unit 2	**DESIGN OF TRANSFORMER** Output equation design of core, yoke and windings, overall dimensions, Computation of no load current to voltage regulation, efficiency and cooling system designs.	**8L**
Unit 3	**DESIGN OF SYNCHRONOUS MACHINES**Output equations of synchronous machines, specific electric and magnetic loadings, separation of main dimensions, Rotor design, Design of field system. Estimation of performance from design data. Flow chart for design of three phase synchronous generators	**8L**
Unit 4	**DESIGN OF INDUCTION MACHINES**Output equations , specific electric and magnetic loadings, factors affecting size of rotating machines, separation of main dimensions, selection of frame size, Rotor design of three phase induction motors. Circle diagram, Estimation of performance from design data. Flow chart for design of three phase induction motors	**8L**
Unit 5	**DESIGN OF DC MACHINES & COMPUTER AIDED DESIGN**Output equation, Main dimensions, Design of armature, commutator, flow chart for design of dc machines. Philosophy of computer aided design, advantages and limitations. Computer aided design approaches analysis- , synthesis and hybrid methods.	**8L**

Text Books:

1. A.K. Sawhney, "Electrical Machine Design", Dhanpat Rai & Sons.
2. S. K. Sen, "Principles of Electrical Machine Design with Computer Programmes", Oxford & IBH Pub. Company

Reference Books

1. M.G. Say, "Alternating Current Machines", Pitman Publishing Company Ltd.
2. A.E. Clayton, "The Performance and Design of DC Machines", Pitman Publishing Company Ltd.
3. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

Outcome of the Course:

- **Students will be able to learn the applications of transformer and induction motor and application regarding representation using piece wise linearization and least square error method.**
- **Students will be able to formulate the mathematical modelling of transformer design, output equation, design dimension of core and yoke.**
- **Students will be able to learn the fundamentals of electrical circuits and thermal circuits of cooling method.**
- **Students will be able to learn the basics of induction motor stator design, electrical and magnetic loading, types and design of winding.**

List of Experiments **Design using MATLAB/Simulink/C**

1. Design of a single phase transformer for distribution
2. Design of a three phase distribution transformer
3. Design of a three phase power transformer
4. Design of a d.c. machine
5. Design of a synchronous generator
6. Design of a synchronous motor.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE349	Subject Title	NON-CONVENTIONAL ENERGY RESOURCES						
LTP	3 1 0	Credit	4	Subject Category	Electives	Year	3rd	Semester	VI

Objectives of the Course

- To introduce fundamentals of various renewable energy source
- The technologies used to harness usable energy from solar, wind, fuel cells
- The technologies used to harness usable energy from ocean geothermal Biomass energy sources.

Unit 1	**Introduction** Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits, present energy scenario.	**8L**
Unit 2	**Solar Cells** - Theory of solar cells. Solar cell materials, solar cell power plant, limitations. Solar Thermal Energy Solar radiation flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.	**8L**
Unit 3	**Geothermal Energy** - Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. **Magneto-hydrodynamics** (MHD) Principle of working of MHD Power plant, performance and limitations.	**8L**
Unit 4	**Fuel Cells** - Principle of working of various types of fuel cells and their working, performance and limitations. Thermo-electrical and thermionic conversions, Principle of working, performance and limitations. **Wind Energy**: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems. **Bio-mass** - Availability of bio-mass and its conversion theory.	**8L**
Unit 5	**Ocean Thermal Energy Conversion** (OTEC) - Availability, theory and working principle, performance and limitations. **Wave and Tidal Wave** - Principle of working, performance and limitations. Waste Recycling Plants	**8L**

Text Books:

1.D.S. Chauhan, “Non-Conventional Energy Resources”, New Age International
2.B.H. Khan, “Non-Conventional Energy Resources”, Tata McGraw Hill

Reference Books

1. Andra Gabdel, "A Handbook for Engineers and Economists".
2. A. Mani, "Handbook of Solar radiation Data for India".
3. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
4. F.R. the MITTRE, "Wind Machines" by Energy Resources and Environmental Series.
5. Frank Kreith, "Solar Energy Hand Book".
6. N. Chermisinogg and Thomes, C. Regin, "Principles and Application of Solar Energy".
7. N.G. Calvert, “Wind Power Principles”.

Outcome of the Course:

- **Identify renewable energy sources.**
- **Understand the mechanism of solar, wind and ocean energy sources.**
- **The understanding of various technologies involved in power generation from renewable energy sources.**
- **Understand the methods to handle the biomass in a productive way.**

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE350	Subject Title	SPECIAL ELECTRICAL MACHINES						
LTP	3 1 0	Credit	4	Subject Category	Electives	Year	3rd	Semester	VI

Objectives of the Course

- To study regarding construction working and purpose of special 3 phase a.c. machines
- To study working and characteristics of servomotors
- To study working, construction and applications of special ac and dc motors

Unit 1	**Poly-phase AC Machines:** Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power), Introduction to multiphase machines.	**8L**
Unit 2	**Single phase Induction Motors:** Construction, starting characteristics and applications of split phase, capacitor start, capacitor run, capacitor start, capacitor-run and shaded pole motors. **Two Phase AC Servomotors:** Construction, torque-speed characteristics, performance and applications	**8L**
Unit 3	**Stepper Motors:** Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications. **Switched Reluctance Motors:** Construction; principle of operation; torque production, modes of operation, drive circuits	**8L**
Unit 4	**Permanent Magnet Machines**: Types of permanent magnets and their magnetization characteristics, demagnetizing effect, permanent magnet dc motors, sinusoidal PM ac motors, brushless dc motors and their important features and applications, PCB motors. **Single phase synchronous motor**; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators.	**8L**
Unit 5	**Single Phase Commutator Motors:** Construction, principle of operation, characteristics of universal and repulsion motors; Linear Induction Motors. Construction, principle of operation, Linear force, and applications	**8L**

Text Books:

1. P.S. Bimbhra "Generalized Theory of Electrical Machines" Khanna Publishers.
2. P.C. Sen "Principles of Electrical Machines and Power Electronics" John willey & Sons, 2001

Reference Books

1. G.K.Dubey "Fundamentals of Electric Drives" Narosa Publishing House, 2001
2. Cyril G. Veinott "Fractional and Sub-fractional horse power electric motors" McGraw Hill International, 1987
3. M.G. Say "Alternating current Machines" , Pitman & Sons

Outcome of the Course:

- **Able to distinguish between normal types of motors and special types of motors**
- **Understand the working of servomotors, stepper motors reluctance motors**
- **Understand and able to select the suitable motor for the type of load**

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE351	Subject Title	INDUSTRIAL ELECTRICAL SYSTEMS						
LTP	3 1 0	Credit	4	Subject Category	Electives	Year	3rd	Semester	VI

Objectives of the Course

- To be able to understand the electrical wiring systems for various applications
- To be able to understand various components of industrial electrical systems.
- To be able to analyze and select the proper size of various electrical system components.

Unit 1	**Electrical System Components:** 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	**8L**
Unit 2	**Residential and Commercial Electrical Systems:** 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.	**8L**
Unit 3	**Illumination Systems** 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.	**8L**
Unit 4	**Industrial Electrical Systems I :** HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.	**8L**
	Industrial Electrical Systems II: DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Selection of UPS and Battery Banks.	
Unit 5	**Industrial Electrical System Automation:** Study of basic PLC, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.	**8L**

Text Books:

1. 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.

Reference Books

1. S. Singh and R.D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997.
2. Web site for IS Standards.
3. H. Joshi, "Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.

Outcome of the Course:

- **Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.**
- **Understand various components of industrial electrical systems.**
- **Analyze and select the proper size of various electrical system components.**
- **To be able to design an illumination scheme for a given building, workshop etc.**

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE352	Subject Title	DIGITAL CONTROL SYSTEM						
LTP	3 0 2	Credit	4	Subject Category	Electives	Year	3rd	Semester	VI

Objectives of the Course

- To introduce the state variable representation of continuous and discrete data control systems, stability analysis and time response analysis using state model,
- The concepts of controllability and observability, basic concepts of digital control systems, their stability analysis,
- Use of state feedback for pole placement design, basic concepts and stability analysis of non linear systems

Unit 1	**Signal Processing in Digital Control** Basic digital control system, advantages of digital control and implementation problems, basic discrete time signals, z-transform and inverse z-transform, modeling of sample-hold circuit., pulse transfer function, solution of difference equation by z-Transform method.	**8L**
Unit 2	**Design of Digital Control Algorithms** Steady state accuracy, transient response and frequency response specifications, digital compensator design using frequency response plots and root locus plots.	**8L**
Unit 3	**State Space Analysis and Design:** State space representation of digital control system, conversion of state variable models to transfer functions and vice versa, solution of state difference equations, controllability and observability, design of digital control system with state feedback.	**8L**
Unit 4	**Stability of Discrete System:** Stability on the z-plane and Jury stability criterion, bilinear transformation, Routh stability criterion on rth plane. Lyapunov's Stability in the sense of Lyapunov, stability theorems for continuous and discrete systems, stability analysis using Lyapunov's method.	**8L**
Unit 5	**Optimal digital control:** Discrete Euler Lagrange equation, max. min. principle, otpimality & Dynamic programming, Different types of problem and their solutions.	**8L**

Text Books:

1. B.C.Kuo, "Digital Control System", Saunders College Publishing.
2. M.Gopal, "Digital Control and State Variable Methods", Tata McGraw Hill.

Reference Books

1. J.R.Leigh, "Applied Digital Control", Prentice Hall, International
2. C.H. Houpis and G.B.Lamont, "Digital Control Systems: Theory, hardware, Software", Mc Graw Hill.

Outcome of the Course:

- Possess in-depth knowledge of concepts from classical control theory, understand the concept of transfer function.
- Find out the time response of a given system and design of different basic controller (P, PI, PID)
- Understand the basic knowledge of servo & servomotor.
- Gain knowledge of finding out system stability in time and frequency domain.
- To draw different plots of control system and compensation design using these plots.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE353	Subject Title	POWER STATION PRACTICE						
LTP	3 1 0	Credit	4	Subject Category	Electives	Year	3rd	Semester	VI

Objectives of the Course

- The course has been designed to fulfill the requirement of power industry.
- The course aims to provide basic fundamentals of economics involved with power generation
- The course aims to provide basic fundamentals of various techniques used for optimization of generation cost.

Unit 1	**Economics of Generation** :Types of loads, demand factor, group diversity factor and peak diversity factor, load curve, load duration curve, load factor, capacity factor and utilization factor, base load and peak load stations, operating and spinning reserves, load forecasting, capital cost of power plants, depreciation, annual fixed and operating charges.	**8L**
Unit 2	**Tariff and Power Factor Improvement** General tariff form and different types of tariffs, Tariff option for DSM. Causes and effect of low power factor, necessity of improvement and use of power factor improvement devices.	**8L**
Unit 3	**Coordinated Operation of Power Plants** Advantages of Coordinated operation of different types of power plants, hydrothermal scheduling: short term and long term. Coordination of various types of power plant.	**8L**
Unit 4	**Electrical Equipments in Power Plants** Governors for hydro and thermal generators, excitation systems; exciters and automatic voltage regulators (AVR), bus bar arrangements.	**8L**
Unit 5	**EHV Substation** Layout of EHV substation, brief description of various equipments used in EHV substations, testing and maintenance of EHV substations equipments. Gas insulated substations (GIS).	**8L**

Text Books:

1. B.R. Gupta, Generation of Electrical Energy, (Euresia Publishing House).
2. M.V. Deshpande, Elements of Electrical Power Station Design, (Wheeler Publishing House).

Reference Books

1. S. Rao, Electrical Substation-Engineering and Practice, (Khanna).
2. S.N. Singh, Electric Power Generation, Transmission and Distribution (PHI).

Outcome of the Course:

- Understanding the economics of power generation.
- Apply design of various new technologies to optimize the economical relations.
- Formulate and solve coordination problem of power system plants.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE354	Subject Title	DIGITAL SIMULATION OF POWER SYSTEM						
LTP	3 0 2	Credit	4	Subject Category	Electives	Year	3rd	Semester	VI

Objectives of the Course

- The objectives of the course are to make the student understand the operation and control of a modern power system,
- To introduce various problems encountered in proper operation of the system and their mitigation.
- Students will learn how to analyze a large interconnected power system through digital simulation.

Unit 1	**Network Matrices:** Graph-theoretic approach for the formation of network matrices – Y BUS , Y BR and Z LOOP ; Z BUS building algorithms, Simulation example.	**8L**
Unit 2	**Short Circuit Studies:** Representation of 3-phase networks. Short circuit studies using 3-phase Z BUS matrix. Fault impedance and admittance matrices for various types of faults. Simulation example.	**8L**
Unit 3	**Power System Control:** Automatic generation control (AGC). Voltage control methods. Reactive power compensation, static VAR systems, FACTS devices.	**8L**
Unit 4	**Optimal System Operation**: Unit commitment. Optimal power flow solution, Hydro–Thermal load scheduling; short range and long range. Determination of Loss-Formula. Simulation example.	**8L**
Unit 5	**Computer Control and Automation:** Database for control: SCADA, State estimation. Contingency analysis and power system security assessment. Modern energy control centres	**8L**

Text Books:

1. Hadi Sadat*: Power System Analysis; (McGraw Hill)

Reference Books

1. Nagrath and Kothari: Power System Analysis; 4th edition (TMH)
2. Grainger and Stevenson: Power System Analysis; (McGraw Hill)
3. El-Abiad and Stagg: Computer Methods in Power System Analysis; (McGrawHill)
4. Wood and Wollenberg: Power Generation Operation and Control; Wiley, NY

Outcome of the Course:

- Model the power system for various studies.
- Analyze the system for different short circuit conditions.
- Address the problem of frequency and voltage control under varying load conditions of the system.
- Optimize the generation scheduling in a hydro-thermal mix including the effect of system losses and maintaining the desired operating conditions.
- Analyze large data, in an interconnected power system, obtained through SCADA and utilize them for state estimation, contingency analysis and security assessment.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS214	Subject Title	Operating Systems						
LTP	3 1 0	Credit	4	Subject Category	DC	Year	2nd	Semester	IV

OBJECTIVE:

This course will facilitate the students to learn the different components and various functioning of an operating system.

Unit 1: Introduction to Operating System. (8)

Introduction: Components of a computer System, Operating system: User view & System view, Evolution of operating system, Single Processor & Multiprocessor systems, Real Time System, Distributed Systems, Multimedia Systems, Handheld Systems.

Operating System Structure: Operating System Services, User Operating System Interfaces: Command-Line and GUI, System Calls.

Unit 2: Management & Scheduling (6)

Process Management: Process Concept, Process States, Process Transition Diagram, Process Control Block (PCB).

CPU Scheduling: Scheduling Concepts, Performance Criteria, Scheduling Queues, Schedulers, Scheduling Algorithms: Preemptive & Non Preemptive: FCFS, SJF, Priority, Round-Robin

Unit 3 Concurrent Processes & Deadlocks (8)

Concurrent Processes: Principle of Concurrency, Producer / Consumer Problem, Co-operating Processes, Race Condition, Critical Section Problem, Peterson's solution, Semaphores, Classical Problem in Concurrency- Dining Philosopher Problem; Inter Process Communication models and Schemes.

Deadlock: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from deadlock.

Unit-4 Memory Management (7)

Memory Management: Bare machine, Resident monitor, Multiprogramming with fixed partition, Multiprogramming with variable partition, Multiple base register, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Cache memory.

Unit- 5: File Systems & I/O Management (7)

File System: Different types of files and their access methods, various allocation methods.

I/O Management and Disk Scheduling: I/O Devices, Organization of I/O functions, Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN, LOOK).

COURSE OUTCOME:

At the end of the course, the student will able to :

CO1. Learn the general architecture& functioning of computers with operating system.

CO2. Describe, contrast and compare differing structures for operating systems.

CO3. Understand and analyze theory and implementation of: processes, resource control (concurrency etc.).

CO4. Understands physical and virtual memory, scheduling, I/O and files

TEXT BOOKS

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley,6th Edition 2006.
2. D M Dhamdhere, "Operating Systems: A Concept based Approach", PHI. 3rd Edition.2017..

REFERENCES

Harvey M. Dietel, " An Introduction to Operating System", Pearson Education ,1st Edition 2009

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS205	Subject Title	Dot Net Technologies						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	2nd	Semester	IV

OBJECTIVE:

This course aims to provide the knowledge to understand the concepts and elementary use of .NET library such as development of windows application and website creation through ASP.NET. Students are also able to learn about the different validation and use of controls available in Visual Studio.

Unit 1: Introduction to Dot Net **(8)**

Introduction .NET framework, features of .Net framework, architecture and component of .Net, elements of .Net (CLS.CTS, CLR &BCL). Assembly, type of assemblies, create dll file, how to create and install shared assemblies.

Introduction to C#: C# Language Fundamentals, Namespace, Using Directive, Defining custom namespaces, Default Assignment and variable scope, Basic input and output with the console class, Understanding value types and reference types, Converting between value type and reference type: Boxing and Unboxing, Operators and Expressions, Iterations constructs, control flow constructs, Understanding static methods, Method parameter modifiers, Array manipulation, String manipulation, Enumerations, Defining structures.

Unit 2: Object Oriented Aspects Of C# **(8)**

Object Oriented Aspects Of C#: Formal definition of the class, Constructor, type of constructor, Destructor, member access modifier(Public, Private, Protected, Internal and Protected Internal), Encapsulation, Polymorphism: Method Overriding and Method Overloading, Override, Virtual, new Keywords, Inheritance: Types of Inheritance and Ineterface ,Abstraction, Sealed Class, Property, Set and get operator ,Indexer, Reflection, Delegates and Events.

Unit 3 Exception Handling in C# **(8)**

Exception, Bug, Error, Exception Handling in .Net, Type of Exception, finally statement, throw and rethrow, difference between System Level Exception and Application Level Exception, Nested try block, Custom Exception, throwing our own exceptions, checked and unchecked operator, handling multiple exception. Garbage collection: Basics, working, finalizing a method, Dispose (), IDisposable Interface, System.GC Type.

Unit-4 Architecture **(7)**

Three tier architecture, MVC architecture, Entity Framework. **Windows Forms:** All about windows form, MDI form, creating Windows applications, adding controls to forms, handling Events, and using various Tools

Unit- 5: Database & Web Application **(8)**

ADO.NET- ODBC, OLEDB, and SQL connected mode, disconnected mode, dataset, data view, data table, data column, data row, data-reader, data adapter.

Web Based Application: Web based application Development On .Net: ASP.NET**,** Differences between ASP and ASP.NET, understanding post back, understanding page life cycle, State management, Master pages.

COURSE OUTCOME:

On successful completion of this course, student should be able to:

CO1. To have knowledge of the structure and model of the programming language C #.

CO2. To Use the programming language C # for various programming technologies.

CO3. To develop software in C #.

CO4. To design web applications using ASP.NET..

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

TEXT BOOKS

1. E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2nd edition 2004.
2. J. Liberty, "Programming C#", O'Reilly,2nd edition 2002.

REFERENCES

1. Herbert Schildt, "The Complete Reference: C#", Tata McGraw-Hill,2nd edition 2004.
2. Robinson et al, "Professional C#", 2nd ed., Wrox Press, 2002.
3. Andrew Troelsen, "C# and the .NET Platform", A! Press, 1st edition 2003.

SR.NO.	EXPERIMENT NAME
1	Program in C# to demonstrate System.Array class members like Clone(), Copy(), Clear() ,Sort() and Reverse().
2	Program in C# to demonstrate System. String members like Contains(),Insert(),Remove(),Replace() and ToUpper().
3	Program in C# Create a Simple Calculator using Text Boxes and Button Tools of Visual Studio which also calculates %, modulus, Root, Clear, Sign Change, and Result
4	Design Login form and create windows form using basic form controls application.
5	Design a form in C# that takes the details of a person (Name, Address and DOB) and enables Radio Button to vote if the age of the person is above 18 and then shows a thanks message.
6	Create a form using Menu Strip Tool and add the following options:-File, Edit,Help. Also add submenu ,for File add :- Open,Close and Exit. For Edit add:- Cut, Copy and Paste.For Help add:-Help and About.
7	Create a windows application which stores an Item (Item_Id, Name,Price,Weight,Type,quantity) in a database. After that there will be a button to view the Detail of Items added. After that create another form from which Item can be removed and Updated.
8	Create a Registration Form with all validations to store the information of a Student in a database. Create Another windows form to assign Elective Subjects to all the students.
9	Create a website for a book store, which sold and give books on rent to customers. Also Store the information of customers
10	Write a Program to demonstrate System.Array class members like Clone(), Copy(), Clear() ,Sort() and Reverse().

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS346	Subject Title	Introduction to Big Data Analytics *(Departmental Elective 3/4)*						
LTP	3 0 2	Credit	4	Subject Category	DE	Year	3rd	Semester	VI

OBJECTIVES: The main goal of this course is to help students learn, understand, and practice big data analytics and machine learning approaches, which include the study of modern computing big data technologies and scaling up machine learning techniques focusing on industry applications. Mainly the course objectives are: conceptualization and summarization of big data and machine learning, trivial data versus big data, big data computing technologies, machine learning techniques, and scaling up machine learning approaches.

Unit 1 Introduction **(6 L)**

Examples, data science articulated, history and context, technology landscape.

Unit 2 Data Manipulation at Scale **(8 L)**

Databases and the relational algebra ,Parallel databases, parallel query processing, in-database analytics ,MapReduce, Hadoop, relationship to databases, algorithms, extensions, languages ,Key-value stores and NoSQL; tradeoffs of SQL and NoSQL

Unit 3 Analytics **(7 L)**

Topics in statistical modeling: basic concepts, experiment design, pitfalls, Topics in machine learning: supervised learning (rules, trees, forests, nearest neighbor, regression), optimization (gradient descent and variants), unsupervised learning.

Unit 4 Communicating Results **(7 L)**

Visualization, data products, visual data analytics, Provenance, privacy, ethics, governance.

Unit 5 Special Topics **(9 L)**

Graph Analytics: structure, traversals, analytics, PageRank, community detection, recursive queries semantic web.

LEARNING OUTCOMES

The students learning outcomes are designed to specify what the students will be able to perform after completion of the course:

CO1. Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.

CO2. Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.

CO3. Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.

CO4. The student will learn about the graph analytics and its application.

Text Book:

1- Mayer-Schönberger, V., & Cukier, K. *Big Data: A Revolution That Will Transform How We Live, Work, and Think*. Boston: Houghton Miffin Harcourt, 2013.

Reference Book:

1- Frank J. Olhorst Big Data Analytics: Turning Big Data into Big Money (Wiley and SAS Business Series),2015

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	IT346	Subject Title	ADVANCED WEB TECHNOLOGY						
LTP	3 0 2	Credit	3.5	Subject Category	L T P	Year	3rd	Semester	VI

Course Objective:

1. The overall goal of the advanced web technology is to make familiar students with various kind of web as well as android applications.
2. The student will learn how to form attractive web pages using ruby and rail server along with HTML and CSS.
3. The student will also learn how to make portable android applications.
4. The student will get practical experiences of these techniques by the implementation, debugging and testing in Programming language like Ruby, Rail server, Android Studio. (During the Lab).

Detailed Syllabus

UNIT 1

Revised tour of basics: HTML with CSS, sample codes in java script, introduction to XML with CSS, working with images, revision of mysql installation and commands. (**4 L)**

UNIT 2

Web development and Bootstrap: Introduction to bootstrap, history of bootstrap, responsive website, usage of bootstrap, first webpage with bootstrap Bootstrap controls – buttons, table, images, button groups, dropdown, collapse, tabs, forms etc. (**10 L)**

UNIT 3

Ruby Introduction: what is ruby?, brief history of ruby, ruby on rails download and installation, first program in ruby, ruby variables and data types- numbers, Boolean, strings etc., puts and print, String functions: length, reverse, upcase, downcase etc., writing comments. (**15 L)**

UNIT 4

Ruby on rails: introduction to rails, installation of DBMS, writing test application for database connections, starting rails web server and open application, sample website project on rails. (**5 L)**

UNIT 5

Android Application Development: introduction to android, download and installation of android studio, understand the structure of hello project, design sample app in SDK, configuration and launching of emulator, load application using mobile phone, introduction to sqllite. (**6 L)**

Learning Outcome

Having successfully completed this course, the student will demonstrate:
1. An ability to perform web applications and solve the real world problem.
2. Ability to work on live web as well as android project in MNCs.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Text book [TB]:

1. Michael Hartl, Ruby on rails tutorial (rails 5) learn web development with rails, ed 4, online

Reference books [RB]:

1. Head First Android Development A Brain-Friendly GuideBy Dawn Griffiths, David GriffithsPublisher: O'Reilly Media, 2015.
2. Programming Ruby 1.9 & 2.0: The Pragmatic Programmers' Guide (The Facets of Ruby) 4th Edition by Dave Thomas (Author), Andy Hunt (Author), Chad Fowler (Author)

List Of Practical's

SR.NO.	EXPERIMENT NAME
1	Design bordered table for storing details of all employees in IT department using bootstrap. Also highlight HOD of department.
2	Insert an image in the webpage in different shapes like circle, rectangle etc.
3	Design login form using bootstrap classes.
4	Design one page web poster of your project using bootstrap.
5	Downloading and installation of ruby on rails.
6	Create a module for simple calculator function.
7	Write a program to calculate factorial of a no using ruby.
8	Write first database application using rails and map the web server.
9	Develop your own website by using bootstrap and rails.
10	Create some basic android applications like: working with button, ToggleButton, checkbox, date-time picker, AlertDialog box etc.
11	Create a MediaPlayer application in android using the above concepts.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	HS304	Subject Title	Aptitude and Soft Skills IV						
LTP	3 0 0	Credit	0	Subject Category	AC	Year	III	Semester	VI

Course Outline: Aptitude and Soft Skills IV is the final step of programme and the module is designed to enhance the analytical and interpersonal skills of students to make them ready to face various placements, interviews. It will also help them learn various personality development techniques by enhancing their GD and PI skills. Mock Placement Drive will test and improve students by Feedback Sharing & Error Correction.

Course Objective:

1. Align themselves with the placement requirements and their needs
2. Learn analytical and employability skills
3. Prepare students for job placements so that they could clear the selection process successfully and give them strategies and skills to crack GD as well as PI to get selected with decent job offers

Course Pre/Co-requisite (if any):

1. Understanding grammar, number system and basic arithmetic, analytical reasoning concepts, covered in Aptitude and Soft Skills III
2. Professional profile building and Self introduction

Detailed Syllabus

UNIT 1: QUANTITATIVE APTITUDE 11 HOURS

Partnership 02 hours

Introduction & types; Speed, Distance and Time: Average Velocity; Race tracks - Straight and Circular; Trains; Boats and Streams.

Time and Work 02 hours

Basic concepts (relationship between men, days and work); Understanding group efficiency; Alternate work; Negative work; Wages; Pipes and Cisterns.

Permutation and Combination 02 hours Basic Principles of Counting (Addition and Multiplication); Arrangements around- Circular, Square and Rectangular tables and in straight lines, circular permutation, selection, distribution.

Probability 02 hours

Introduction, various types of events; Classical definition of probability; Random and Discrete variables; Bayes' Theorem and question types.

Data Interpretation 03 hours

Introduction; Different ways of representing data- Narration based, pictorial, pie chart, Bar graph, line charts; various questions based upon them.

UNIT 2: VERBAL APTITUDE 09 HOURS

Cloze test 02 hours

Intricacies of cloze test, correct use of specific adjectives, concept of sentence improvement, writing concept, auxiliaries and modals.

Words 02 hours

Concept of consistency, precision, concision in terms of reading and writing, advance word choice with respect to placement papers, SAP (Subject-Audience-Purpose) approach.

Clauses **02 hours**

Subordinate Clauses- The noun clause, the adjective clause, the adverb clause, Analysis of simple and complex sentences, prepositional phrases, transformation of sentences.

Vocabulary **01 hour**

Revisiting vocabulary- high, medium and low frequency words, organization of ideas an thoughts in order to understand the text- The Pyramid Principle.

Questions **02 hours**

Various test taking skills in accordance with the placement papers.

UNIT 3: LOGICAL REASONING **11 HOURS**

Deductive Logic **03 hours**

Premises and conclusion structure, Quality of deductive argument, Categorical arguments, Syllogism, Conditional Arguments- If..then, only if..then, If and only if , Either or.

Puzzles **02 hours**

Grouping and selection, Double line up, Binary logic- truth teller-lie teller, Team formation and miscellaneous puzzles.

Set Theory and Critical Reasoning-II **03hours** Union and Intersection of sets, Use of venn diagrams in problem solving with two, three, four set, concept of maxima-minima through Venn diagram.

Critical reasoning II: Statement and Inference, cause and Effects, Statement and Arguments- Strengthen or Weaken the argument, Statement Assertion and Reason.

Non-Verbal Reasoning **01 hour**

Mirror-image, Water-image, Spotting out the embedded figures, Completion of incomplete pattern, Figure matrix, Paper folding, Paper cutting, Grouping of identical figures, Counting figures, Non verbal series / analogies / odd man out.

Data Sufficiency **02 hours**

Data Sufficiency based on logical reasoning field like Coding-Decoding / Puzzle Test / Blood Relations / Mathematical calculations / clock / calendar / etc.

UNIT 4: SOFT SKILLS **08 HOURS**

Group Discussion **04 hours**

Importance, Do's & Don'ts, Personality Traits, Tips and Strategies, Types of Group Discussions.
Suggested Exercises, Games & Activities: Mock Group Discussions (on basic topics), with feedback sharing and error analysis.

Personal Interview **04 hours**

Importance, Do's & Don'ts, Personality Interview, Tips and Strategies, Etiquette Rules.
Suggested Exercises, Games & Activities: Mock Personal Interviews (contd.) with feedback sharing and error analysis.

Learning Outcomes:

By the end of this semester, students will:

1. Be prepared for the upcoming placements and they will also be ready for other competitive exams.

2. Improve their GD and PI Skills and be able to have firsthand experience of a Placement drive and gain sufficient confidence to perform well.

Text book [TB]:

1. Quantitative Aptitude **:** How to prepare for Quantitative Aptitude, Arun Sharma, McGraw Hill, 8th edition, 2018.
2. Logical Reasoning**:** A Modern Approach to Logical Reasoning-R.S. Aggarwal, S Chand Publishing; 2nd Colour edition-2018.
3. Verbal Aptitude : English is Easy- Chetanand Singh, BSC Publication-2018.
4. Soft Skills : Group Discussion on Current Topics by P. N. Joshi; Upkar Prakashan-2010.

Reference books [RB]:

1. Quantitative Aptitude:Quantitative Aptitude for Competitive Examinations- R.S. Agarwal, S. Chand Publications-2017.

Quantitative Aptitude:Quantitative Aptitude-Saurabh Rawat & Anushree Sah Rawat Savera Publishing House, 1st edition-2016.

2. Logical Reasoning: Logical Reasoning and Data Interpretation for the CAT - Nishit K Sinha, Pearson India; 5th edition-2016.
   Logical Reasoning: Wiley's Verbal Ability and Reasoning - P A ANAND, Wiley-2016.
3. Verbal Aptitude: Oxford Guide to English Grammar- John Eastwood, Oxford University Press-2003.
   Verbal Aptitude: Fun with grammar- Suzanne W. Woodward Pearson Education ESL-1996.
4. Soft Skills: AComplete Kit for Group Discussion by S. Hundiwala; Arihant publications; edition-2018.
   Soft Skills: Basic Interviewing Skills by Raymond L. Gorden, Waveland Press, Inc.; 1 edition-1998.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE401	Subject Title	SWITCHGEAR AND PROTECTION						
LTP	3 0 2	Credit	4	Subject Category	Univ. Core	Year	4th	Semester	VII

Objectives of the Course

- To introduce the basic concepts of different protection schemes,
- To introduce the basic concepts of Relays, Circuit breakers
- To introduce the basics of Arc Interruption Theory and Power System Transients.

Unit 1	**PROTECTIVE Relays:** Basic principles, types, Construction and characteristics of electromagnetic relays, Elements of static relays, Comparators, Basic principle of digital relays, Overcurrent , Earth fault and differential relays.	**8L**
Unit 2	**Protection Schemes:** Protection of generators, transformers, transmission line, busbar and motors	**8L**
Unit 3	**Arc Interruption Theories:** Formation and extinction of arc, properties of the arc, Restriking and recovery voltage, Methods and control devices for arc extinction, Current chopping, Resistance switching	**8L**
Unit 4	**Circuit breakers:** Oil circuit breaker, Air blast circuit breaker, SF6 circuit breaker, Vacuum circuit breaker, Circuit breaker duties and ratings, Testing and maintenance of circuit breakers, HRC and other types of fuse, Isolators	**8L**
Unit 5	**Power System Transients:** Overvoltage in the transmission lines, Fault clearance, Lightning and switching surges, Transmission, refraction and attenuation of surges. Ground wire, Sphere gaps, Lightning arrestors, BIL and insulation coordination, Grounding of power system.	**8L**

Text Books:

1.Switchgear and protection Sunil S. Rao, Khanna Publishers
2.Power System Engg. Soni Gupta & Bhatnagar, Dhanpat Rai & Sons
3.A course in Electrical Power, C.L. Wadhawa, New Age International
4.Power system protection and switchgear, B. Ram, Wiley Eastern Ltd.

Reference Books

1.Power system protection & switchgear, Badriram & D.V. Vishwakarma, TMH
2.Switchgear & Protection, M.V. Deshpande, TMH

Outcome of the Course:

- **Learn the fundamental concept of different types of protective relays.**
- **Apply fundamental concepts of various protection schemes.**
- **Use different types of circuit breakers according to their principle of operation, characteristics, ratings and their duties.**
- **Become familiar with arc properties, their formation and extinction.**
- **Become familiar with Power System Transients, Lightning arrestors, BIL and insulation coordination.**

List of Experiments

1. To determine direct axis reactance (xd) and quadrature axis reactance (xq) of a salient pole alternator.
2. To determine negative and zero sequence reactances of an alternator.
3. To determine sub transient direct axis reactance (xd) and sub transient quadrature axis reactance (xq) of an alternator
4. To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation
5. To study the IDMT over current relay and determine the time current characteristics
6. To study percentage differential relay
7. To study Impedance, MHO and Reactance type distance relays
8. To determine location of fault in a cable using cable fault locator
9. To study ferranty effect and voltage distribution in H.V. long transmission line using transmission line model.

10. To study operation of oil testing set.

Simulation Based Experiments (using MATLAB or any other software)

11. To determine transmission line performance.
12. To obtain steady state, transient and sub-transient short circuit currents in an alternator
13. To obtain formation of Y-bus and perform load flow analysis
14. To perform symmetrical fault analysis in a power system
15. To perform unsymmetrical fault analysis in a power system

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE402	Subject Title	ANN & FUZZY LOGIC						
LTP	3 0 2	Credit	4	Subject Category	Univ. Core	Year	4th	Semester	VII

Objectives of the Course

- To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations
- Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.
- Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
- Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
- Reveal different applications of these models to solve engineering and other problem

Unit 1	**Neural Networks-1(Introduction & Architecture):** Neuron, biological neuron, Artificial Neuron and its model, activation functions, Neural network architecture: Single layer and multilayer feed forward networks, recurrent networks, and various learning techniques.	**8L**
Unit 2	**Back propagation networks Architecture:** perceptron model, single layer artificial neural networks, multilayer perceptron model; back propagation algorithm, effects of learning coefficient; factors affecting back propagation training, applications.	**8L**
Unit 3	**Fuzzy logic-I (Introduction):** Basic concept of fuzzy, Fuzzy sets and crisp sets, Fuzzy sets theory and operations, Properties of fuzzy sets. Fuzzy and crisp relation.	**8L**
Unit 4	**Fuzzy Membership Functions, Rules:** Membership functions, inference in fuzzy logic, fuzzy if then rules, fuzzifications & defuzzifications, fuzzy controller.	**8L**
Unit 5	**Application of Neural and fuzzy logic:** Application of neural network, Neural Network approach in load flow study. Fuzzy logic application in industries.	**8L**

Text Books:

1. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI

Reference Books

1. Simon Haykins, "Neural Networks" Prentice Hall of India
2. Moore, "Digital control devices", ISA press, 1986.
3. Kumar Satish, "Neural Networks", Tata Mc Graw Hill
4. Timothy J Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill 1997

Outcome of the Course:

- Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
- Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
- To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations
- Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications
- Reveal different applications of these models to solve engineering and other problem

List of Experiments **MATLAB based**

1. Implementation of Single Layer Perceptron Model
2. Classification with a 2-Input Perceptron Model
3. Implementing and plotting a perceptron model
4. Train neural network with backpropagation
5. To Train A Two-layer Perceptron Model
6. Getting Started with Fuzzy Logic Toolbox
7. To create a custom membership function
8. To use a Gaussian membership function

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE403	Subject Title	MATLAB FOR ENGINEERS						
LTP	1 0 4	Credit	3	Subject Category	Univ. Core	Year	4th	Semester	VII

Objectives of the Course

- To aim at providing programming skills from basic level onwards using MATLAB software
- To aim at using MATLAB software for data acquisition, data analysis,
- TO aim at using MATLAB software for graphical visualization, numerical analysis, algorithm development, signal processing and many other applications.

Unit 1	**Basics** MATLAB environment, Variables, Basic data types, Relational and Logic operators, Conditional statements, Input and Output, Loops and branching.	**8L**
Unit 2	**Matrices** Creating and Manipulating matrices, Matrix maths and Matrix functions, Colon operator, Linspace, Cross product, Dot product, Logical functions, Logical indexing, 3-dimensional arrays, Cell arrays, Structures, Plotting: 2-D and 3-D plots: Basic plots, subplots, Histograms, Bar graphs, Pie charts.	**8L**
Unit 3	**Simulink** Introduction, Block diagram, Functions, Creating and working with models, Defining and managing signals, Running a simulation, analyzing the results.	**8L**
Unit 4	**M-file scripts** Creating, saving and running an M-file, Creating and running of a function, Function definition line, H1 and help text lines, Function body, Sub-functions, Nested functions, File I/O handling, M-file debugging.	**8L**
Unit 5	**Applications** Root finding, Data analysis, Statistical functions, Polynomials, Curve fitting, Interpolation, Ordinary differential equations, Integration and differentiation, Signal processing applications, Circuit analysis applications, Control system applications.	**8L**

Text Books:

1. D Hanselman and B Littlefield, Mastering Matlab 7, Pearson Education.

Reference Books

1. A Gilat, Matlab: An Introduction with Applications, John Wiley and Sons, 2004.
2 Y Kirani Singh and B BChaudhari, Matlab Programming, Prentice Hall of India, 2007
3. *Steven T Karris, Introduction to Simulink with Engineering Applications, 2nd edition, Orchard Publication, 2008.

Outcome of the Course:

- Illustrate the direct connection between the theory and real-world applications encountered in the typical engineering and technology programs.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE441	Subject Title	POWER QUALITY						
LTP	3 1 0	Credit	4	Subject Category	Electives	Year	4th	Semester	VII

Objectives of the Course

- Learn to distinguish between the various categories of power quality problems.
- Understand the root of the power quality problems in industry and their impact on performance and economics.
- Learn to apply appropriate solution techniques for power quality mitigation based on the type of problem.

Unit 1	**Power Quality Terms and Definitions** Introduction, transients, sag and swell, short duration/long duration voltage variations, voltage imbalance, waveform distortion, voltage fluctuations, power frequency variation. **Power Quality Problems**: Poor load power factor, loads containing harmonics, notching in load voltage, DC offset in loads, unbalanced loads, disturbance in supply voltage	**8L**
Unit 2	**Fundamentals of Harmonics:** Representation of harmonics, waveform, harmonic power, measures of harmonic distortion; current and voltage limits of harmonic distortion: IEEE, IEC, EN, NORSOK **Causes of Harmonics:** 2-pulse, 6-pulse and 12-pulse converter configurations, input current waveforms and their harmonic spectrum; Input supply harmonics of AC regulator, integral cycle control, cycloconverter, transformer, rotating machines, ARC furnace, TV and battery charger.	**8L**
Unit 3	**Effect of Harmonics:** Parallel and series resonance, effect of harmonics on static power plant-transmission lines, transformers, capacitor banks, rotating machines, harmonic interference with ripple control systems, power system protection, consumer equipments and communication systems, power measurement.	**8L**
Unit 4	**Elimination/Suppression of Harmonics:** High power factor converter, multi-pulse converters using transformer connections (Delta, polygon) **Passive Filters:** Types of passive filters, single tuned and high pass filters, filer design criteria, double tuned filters, damped filters and their design. **Active Power filters:** Compensation principle, classification of active filters by objective, systems configuration, power circuit and control strategy.	**8L**
Unit 5	**Shunt Active Filter:** Single phase active filter, principle of operation, expression for compensating current, concept of constant capacitor voltage control; Three phase active filter: Operation, analysis and modeling; Instantaneous reactive power theory **Three phase series active filters:** Principle of operation, analysis and modeling. **Other Techniques:** Unified power quality conditioner, voltage source and current configurations, principle of operation for sag, swell and flicker control	**8L**

Text Books:

1. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.Wayne Beaty, 'Electrical Power Systems Quality' McGraw Hill, 2003. (For Chapters1,2,3, 4 and 5)

Reference Books

1. G.T. Heydt, 'Electric Power Quality', 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994). (For Chapter 1, 2, 3 and 5)
2. M.H.J Bollen, 'Understanding Power Quality Problems: Voltage Sags and Interruptions', (New York: IEEE Press, 1999). (For Chapters 1, 2, 3 and 5)
3. J. Arrillaga, N.R. Watson, S. Chen, 'Power System Quality Assessment', (NewYork: Wiley, 1999).

Outcome of the Course:

- **Understand the definition of power quality disturbances, and their causes, detrimental effects and solutions; Understand the causes of power quality problems and relate them to equipment.**
- **To introduce the harmonic sources, passive filters, active filters and standards.**
- **To know the power quality monitoring method, equipments and develop the ability to analyze the measured data**

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE442	Subject Title	OPTIMIZATION TECHNIQUES						
LTP	3 0 2	Credit	4	Subject Category	Electives	Year	4th	Semester	VII

Objectives of the Course

- To Introduce The Basic Concepts Of Linear Programming
- To Educate On The Advancements In Linear Programming Techniques
- To Introduce Non-Linear Programming Techniques
- To Introduce The Interior Point Methods Of Solving Problems
- To Introduce The Dynamic Programming Method

Unit 1	**LINEAR PROGRAMMING Introduction** – Formulation Of Linear Programming Model-Graphical Solution–Solving LPP Using Simplex Algorithm – Revised Simplex Method.	**8L**
Unit 2	**ADVANCES IN LPP** Duality Theory- Dual Simplex Method – Sensitivity Analysis–-Transportation Problems– Assignment Problems-Traveling Sales Man Problem -Data Envelopment Analysis.	**8L**
Unit 3	**NON LINEAR PROGRAMMING C**lassification Of Non Linear Programming – Lagrange Multiplier Method – Karush – Kuhn Tucker Conditions–Reduced Gradient Algorithms–Quadratic Programming Method – Penalty And Barrier Method.	**8L**
Unit 4	**INTERIOR POINT METHODS** Karmarkar's Algorithm–Projection Scaling Method–Dual Affine Algorithm–Primal Affine Algorithm Barrier Algorithm.	**8L**
Unit 5	**DYNAMIC PROGRAMMING** Formulation Of Multi Stage Decision Problem–Characteristics–Concept Of Sub-Optimization And The Principle Of Optimality–Formulation Of Dynamic Programming–Backward And Forward Recursion– Computational Procedure–Conversion Offinal Value Problem In To Initial Value Problems	**8L**

Text Books:

1. Hillier And Lieberman "Introduction To Operations Research", TMH, 2000.
2. R.Panneerselvam, "Operations Research", PHI, 2006
3. Hamdy ATaha, "Operations Research –An Introduction", Prentice Hall India, 2003.

Reference Books

1. Philips, Ravindran And Solberg, "Operations Research", John Wiley, 2002.
2. Ronald L.Rardin, "Optimization In Operation Research" Pearson Education Pvt. Ltd. New Delhi, 2005.

Outcome of the Course:

- **To be able to solve linear optimization problems applicable to engineering based problems**
- **To be able to grasp the nuances of advanced techniques used in linear problem programming**
- **To be able to classify linear and non linear system from optimization point**
- **To apply the optimization techniques to practical problems faced in day to day scenario.**

List of Experiments

1. Study of Introduction to MATLAB
2. Study of basic matrix operations
3. To solve linear equation
4. Solution of Linear equations for Underdetermined and Over determined cases.
5. Determination of Eigen values and Eigen vectors of a Square matrix.
6. Solution of Difference Equations.
7. Solution of Difference Equations using Euler Method.
8. Solution of differential equation using 4th order Runge- Kutta method.
9. Determination of roots of a polynomial.
10. Determination of polynomial using method of Least Square Curve Fitting.
11. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds from the given data.
12. Determination of time response of an R-L-C circuit.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE443	Subject Title	ELECTRIC DRIVES						
LTP	3 0 2	Credit	4	Subject Category	Electives	Year	4th	Semester	VII

Objectives of the Course

- To introduce the basic concepts of dc electric drives and ac electric drives
- To understand dc and ac electric drives closed-loop operation
- To understand dc and ac electric drives operation including microprocessor based arrangements.

Unit 1	**Fundamentals of Electric Drive:** Electric Drives and its parts, advantages of electric drives, classification of electric drives; Speed-torque conventions and multi-quadrant operations; Types of load, Load torque: components, nature and classification **Dynamics of Electric Drive:** Dynamics of motor-load combination; Steady state stability of Electric Drive; Load equalization	**8L**
Unit 2	**Selection of Motor Power rating:** Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty. **Electric Braking:** Purpose and types of electric braking, braking of dc, three phase induction and synchronous motors	**8L**
Unit 3	**Dynamics During Starting and Braking:** Calculation of acceleration time and energy loss during starting of dc shunt and three phase induction motors, methods of reducing energy loss during starting; Energy relations during braking, dynamics during braking **Special Drives:** Switched Reluctance motor,.	**8L**
Unit 4	**Power Electronic Control of DC Drives:** Single phase and three phase controlled converter fed separately excited dc motor drives (continuous conduction only); dual converter fed separately excited dc motor drive; rectifier control of dc series motor; Chopper control of separately excited dc motor and dc series motor.	**8L**
Unit 5	**Power Electronic Control of AC Drives:** **Three Phase induction Motor Drive:** Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converterbased) static rotor resistance and slip power recovery control schemes.	**8L**

Text Books:

1. G.K. Dubey, “Fundamentals of Electric Drives”, Narosa publishing House.
2. V.Subrahmanyam, “Electric Drives: Concepts and Applications”, Tata McGraw Hill.

Reference Books

1. M.Chilkin, “Electric Drives”, Mir Publishers, Moscow.
2. Mohammed A. El-Sharkawi, “Fundamentals of Electric Drives”, Thomson Asia Pvt. Ltd. , Singapore.
3. N.K. De and Prashant K. Sen, “Electric Drives”, Prentice Hall of India Ltd.
4. S.K. Pillai, “A First Course on Electric Drives”, New Age International.

Outcome of the Course:

- Apply the knowledge of drives and use them effectively.
- Suggest the particular type of AC drive system for an application.
- Suggest the particular type of DC drives system for an application.

List of Experiments

Hardware Based Experiments:

1. To study speed control of separately excited dc motor by varying armature voltage using single-phase fully controlled bridge convertor.
2. To study speed control of separately excited dc motor by varying armature voltage using single-phase half controlled bridge convertor.
3. To study speed control of separately excited dc motor using single-phase dual converter (Static Ward-Leonard Control)
4. To study speed control of separately excited dc motor using MOSFET/IGBT chopper.
5. To study closed loop control of separately excited dc motor.
6. To study speed control of single-phase induction motor using single-phase ac voltage controller.
7. To study speed control of three-phase induction motor using three-phase ac voltage controller.
8. To study speed control of three-phase induction motor using three-phase current source inverter.
9. To study speed control of three-phase induction motor using three-phase voltage source inverter.
10. To study speed control of three-phase slip ring induction motor using static rotor resistance control using rectifier and chopper.
11. To study speed control of three-phase slip ring induction motor using static scherbius slip power recovery control scheme.

Simulation Based Experiments (using MATLAB or any other software)

1. To study starting transient response of separately excited dc motor.
2. To study speed control of separately excited dc motor using single phase fully/half controlled bridge converter in discontinuous and continuous current modes.
3. To study speed control of separately excited dc motor using chopper control in motoring and braking modes.
4. To study starting transient response of three phase induction motor.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EC353	Subject Title	MICROCONTROLLER						
LTP	3 0 2	Credit	4	Subject Category	Dept. Elec.	Year	3rd	Semester	VI

OBJECTIVES:

- To understand the concept of microcontroller based system.
- To enable design and programming of microcontroller based system.
- To know about the interfacing circuits.

UNIT I:INTRODUCTION:

Introduction, Comparison of microprocessor and microcontroller, evolution of microcontrollers from 4 bit to 32 bit, development tools for microcontrollers: Concept of IDE, Editor, Assembler, Compiler, Linker, Simulator, Debugger and assembler directives **6L**

UNIT II: MICROCONTROLLER 8051:

Block Diagram, Pin diagram and Pin Functions, General Purpose and Special Function Registers, Oscillator and clock circuit, Reset circuit, I/O Port circuits, Memory organization, Internal program and data memory. **8L**

UNIT III: ADDRESSING MODES, INSTRUCTION SET OF 8051:

Addressing modes and accessing memory using various addressing modes, instruction set: Arithmetic, Logical, Simple bit, jump, loop and call instructions and their usage. Time delay generation and calculation, Timer/ Counter programming. **8L**

UNIT IV: ASSEMBLY LANGUAGE PROGRAMMING:

Data Transfer: Block move, Exchange, Sorting, Finding largest element in an array. Arithmetic Instructions: Addition/subtraction, multiplication and division, Boolean & Logical Instructions (Bit manipulations). Code conversion: BCD to ASCII, ASCII to Decimal, Decimal to ASCII, Programs to generate delay using on-Chip timer / Counter. **8L**

UNIT V: INTERFACING AND APPLICATION OF MICROCONTROLLER:

Interfacing of PPI 8255, DAC (0804), Temperature measurement (LM35), interfacing seven segment displays, displaying information on a LCD, stepper motor interfacing, DC motor interfacing and PWM,, Interfacing a 4 X 4matrix Keypad, Generation of different types of waveforms using DAC. **8L**

Text Books:

1. Muhammad Ali Mazidi, Janice GillispieMazidi and RolinMcKinlay, 'The 8051 Microcontroller and Embedded Systems Using Assembly and C', (Second Edition, Pearson Education).

Reference Books:

1. Manish K Patel, "The 8051 Microcontroller Based Embedded Systems", McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
2. Raj Kamal, "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005
3. K. J. Ayala, D. V. Gadre, 'The 8051 Microcontroller & Embedded Systems using Assembly and C, Cengage Learning , India Edition.

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- Micro-controller and its applications.
- Interfacing of Microcontroller.

List of Experiments:

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division.
3. Boolean & Logical Instructions (Bit manipulations).
4. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII;
5. Programs to generate delay using on-Chip timer /Counter.

II. INTERFACING

Write Assembly programs to interface 8051 chip to Interfacing modules.

1. Familiarization with KEIL, PROTEUS simulator and trainer kit.
2. Read Push-button switch and display its status on LED.
3. Interfacing 7-Segment LED Display with 8051 microcontroller.
4. Interfacing of 16x2 LCD with 8051 microcontroller and display message on it.
5. Interface 4x4 matrix keyboard with 8051 microcontroller. Display value of pressed switch on LCD.
6. Stepper and DC motor control interface to 8051 microcontroller.

List of Two Value Added Experiments:

1. External ADC and Temperature control interface to 8051 microcontroller.
2. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
3. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS302	Subject Title	ARTIFICIAL INTELLIGENCE						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	3rd	Semester	V

OBJECTIVES: To provide the foundations for AI problem solving techniques and knowledge representation formalisms.

Unit-1 **(6 L)**

Introduction- Definitions, Intelligent Agents, Problem solving and Search- Uninformed Search, Informed Search, MiniMax Search, Constraint Satisfaction Problem.

Unit-2 **(6 L)**

Prolog-Introduction to Prolog, Syntax and Meanings of Prolog Programs, Operators and Arithmetic, Prolog for Artificial Intelligence.

Unit-3 **(8 L)**

Knowledge Representation- Introduction, Approaches and Issues in Knowledge Representation, Propositional Logic and Inference, First-Order Logic and Inference, Unification and Resolution.

Unit-4 **(8 L)**

Reasoning- Introduction, Types of Reasoning, Probabilistic Reasoning, Probabilistic Graphical Models, Certainty factors and Rule Based Systems, Introduction to Fuzzy Reasoning.

Unit-5 **(8 L)**

Planning and Learning- Introduction to Planning, Types-Conditional, Continuous, Multi-Agent.
Introduction to Learning, Categories of Learning, Inductive Learning, Reinforcement Learning, Decision Tree Learning, Basic Introduction to Neural Net Learning.

LEARNING OUTCOMES

CO1. Ability to identify and formulate appropriate AI methods for solving a problem
CO2. Ability to implement AI algorithms
CO3. Ability to compare different AI algorithms in terms of design issues, computational complexity, and assumptions
CO4. Student will be able to use the concepts of AI for real world problem solving.

Text Books:-

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, Third Edition, 2015.
2. Elaine Rich, Kevin Knight and Shivashankar B.Nair, “Artificial Intelligence”, Tata McGraw-Hill, Third edition, 2009.
3. Nils J.Nilsson, “Artificial Intelligence - A New Synthesis", Harcourt Asia Pvt. Ltd., Morgan Kaufmann, 1988.

Reference Books:-

1. Ivan Bratko, “Prolog Programming for Artificial Intelligence”, Pearson Education Asia, First Edition, 2007.
2. Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, PHI Learning, Second Edition, 2005.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS442	Subject Title	CRYPTOGRAPHY AND NETWORK SECURITY *(Departmental Elective 6)*						
LTP	3 0 2	Credit	4	Subject Category	DE	Year	4th	Semester	VII

OBJECTIVES:

Students undergoing this course are expected to learn fundamentals and advanced concepts of cryptography and its application to network security, security services, and firewalls & threats.

Unit I : (6 L)

Introduction to security attacks, services and mechanism, introduction to cryptography.

Conventional Encryption: Conventional encryption model, classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography,stream and block ciphers.

Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, confidentiality using conventional encryption, traffic confidentiality, key distribution

Unit II : (8 L)

Introduction to prime and relative prime numbers, finite field of the form GF(p), modular arithmetic, Fermat's and Euler's theorem, primarily testing, Euclid's Algorithm, Chinese Remainder theorem, Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffie-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elgamel encryption.

Unit III : (8 L)

Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA).Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

Unit IV : (7 L)

Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.

Unit V : (8 L)

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET).

System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

LEARNING OUTCOMES

After completing the course the students have knowledge

Co1. To compare various Cryptographic Techniques

CO2. Demonstrate various data encryption techniques

CO3. Explain the various Security Application

CO4 Students will learn about use and application of cryptography on networks.

Text Book:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education; Seventh edition,2017

Reference Book:

1. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag., 2nd edition 2004
2. Bruce Schiener, "Applied Cryptography", Wiley; 2nd edition 2007

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	IT441	Subject Title	Deep Learning					
LTP	3 0 2	Credit	4	Subject Category	DE	Year	4th	Semester	7th

Course Objective:

1. Understand basic concepts in pattern recognition
2. Gain knowledge about state-of-the-art algorithms used in pattern recognition research
3. Understand pattern recognition theories, such as Bayes classifier, linear discriminant analysis.
4. Apply pattern recognition techniques in practical problems.

Course Pre/Co- requisite (if any) : Basics of Machine Learning, concept of statistics

Detailed Syllabus

UNIT 1

Linear Algebra: Scalars, Vectors, Matrices and Tensors, Multiplying Matrices and Vectors, Identity and Inverse Matrices, Linear Dependence and Span, Norms, Special Kinds of Matrices, Vectors, Eigen decomposition, Singular Value Decomposition, Example: Principal Components Analysis

Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Bayes' Rule, The Chain Rule of Conditional Probabilities, Independence and Conditional Independence, Expectation, Variance and Covariance, Structured Probabilistic Models.

(8 L)

UNIT 2

Machine Learning Basics: Learning Algorithms, Capacity, Over-fitting and Under-fitting Hyperparameters and Validation Sets, Estimators, Bias and Variance Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent.

(5 L)

UNIT 3

Regularization for Deep Learning: Parameter Norm Penalties,Norm Penalties as Constrained Optimization ,Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning. **(9 L)**

UNIT 4

The Convolution Operation, Motivation, Pooling ,Convolution and Pooling as an Infinitely Strong Prior ,Variants of the Basic Convolution Function, Structured Outputs ,Data Types, Efficient Convolution Algorithms, Optimization for Training Deep Models, Applications. **(6 L)**

UNIT 5

Linear Factor Models**,** Probabilistic PCA and Factor Analysis, Independent Component Analysis (ICA),Monte Carlo Methods**,** The Log-Likelihood Gradient. **(7 L)**

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Learning Outcome

At the end of the course Learning Outcomes Having successfully completed this course, the student will demonstrate:

1. Ability to apply knowledge of advanced principals to the analysis of electrical and computer engineering problems.
2. Ability to apply knowledge of advanced techniques to the design of electrical and computer engineering systems.
3. ability to use the appropriate state-of-the art engineering references and resources, including IEEE research journals and industry publications, needed to find the best solutions to electrical and computer engineering problems

Text book [TB]:

1. Deep Learning, Ian Goodfellow, Yoshua Bengio and Aaron Courville

Reference books [RB]:

1. Building Machine Learning Systems with Python, Willi Richert, Luis Pedro Coelho, Packt open source.

List of Practicals

SR.NO.	EXPERIMENT NAME
1	Study of various Deep Learning Tools
2	Write a program to implement OR, AND gate using Perceptron with learning rule.
3	Write a program for classification in a data set.
4	Implement Linear Regression problem
5	Implement a classification/ logistic regression problem
6	Create, initialize and display simple variables and simple strings and use simple formatting for variable
7	Create/Define single dimension / multi-dimension arrays, and arrays with specific values like array of all ones, all zeros, array with random values within a range, or a diagonal matrix
8	Use conditional statements and different type of loops based on simple examples.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	CS481	**Subject Title**	Software Quality Engineering						
LTP	3 0 0	**Credit**	3	**Subject Category**	DE/OE	**Year**	4th	**Semester**	VII

UNIT-I: Introduction (7 L)

Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Quality Metrics (8 L)

Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT-III: Software Quality Management and Models (8 L)

Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Quality Assurance (8 L)

Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT-V: Software Verification, Validation & Testing: (8 L)

Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

Text Book:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley-Interscience, 2005; ISBN 0-471- 713457.
2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley (2002), ISBN: 0201729156

Reference Book:

1. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley Professional
2. Taz Daughtrey, Fundamental Concepts for the Software Quality Engineer, ASQ Quality Press.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	IT353	Subject Title	Basics of Data Science						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VII

Course Objective:

1. The objective of the course is to make the students understand the different techniques for efficient mining of the data.
2. To introduce students to the concepts, processes and practice of Inference Rules at different abstraction levels of Data.
3. To provide an understanding of the Data management perspective regarding the use of business intelligence (BI), Data Mining systems and Advanced Applications.

Detailed Syllabus

UNIT 1

Data Science :Introduction to Data Science, Overview, Motivation, Data Mining-Definition & Functionalities.

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi-Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

(12L)

UNIT 2

Data Pre-Processing: Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Inconsistent Data, Data Integration and Transformation.

Data Reduction: Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

Data objects and attribute types, Measuring Data Similarity and Dissimilarity, Cosine Similarity.

(**7 L)**

UNIT 3

Concept Description: Definition, Data Generalization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Box Plots, Measuring Dispersion of Data, Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases , FP-growth algorithm.

(7 L)

UNIT 4

Classification: What is Classification, Issues regarding Classification, Attribute selection measures, Information Gain, Gain Ratio, Gini Index, Decision tree, Naïve Bayesian Classification, Metrics for evaluating classifier performance, Confusion matrix. **(6 L)**

UNIT 5

Cluster Analysis: Data types in cluster analysis, Overview of basic clustering methods, Partitioning methods: K-Means and K-medoids technique, Hierarchical Clustering: Agglomerative and Divisive, Density Based Methods :DBSCAN and OPTICS, Grid Based Methods: STING and CLIQUE, Outlier Analysis.

(8 L)

Learning Outcome

The course provides the students the ability to:

1 - Undertake systematic investigation/research related to the Data mining Concepts
2- Understand advanced Database systems and technologies for today's dynamic business environment.

Text book [TB]:

1. Jiawei Han, MichelineKamber, "Data Mining Concepts & Techniques" Elsevier.

Reference books [RB]:

1. M.H.Dunham,"DataMining :Introductory and Advanced Topics" Pearson Education
2. Mallach,"Data Warehousing System" ,McGraw –Hill

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	IT356	Subject Title	Multimedia						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VII

Course Objective:

1. To make students learn about basic understanding of the multimedia objects and tools for object generation
2. To teach students audio and video file formats used now days as a part of IT generation.
3. To make students learn clear understanding of multimedia projects.
4. To make students learn different compression techniques.

Detailed Syllabus

UNIT 1

Introduction: Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work, Stages of Multimedia Projects, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools **(8 L)**

UNIT 2

Multimedia Building Blocks: Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.
(8 L)

UNIT 3

Data Compression: Introduction to data compression, Compression ratio, loss less & lossy compression, Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding ,Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77,LZ78, LZW compression.
(8 L)

UNIT 4

Image, Audio and Video Compression: Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression, lossy graphic compression, image file format, animations Images standards, JPEG Compression, Zigzag Coding, Multimedia Database. Content based retrieval for text and images, Video Compression, MPEG standards, MHEG Standard Video Streaming on net.
(8 L)

UNIT 5

Advanced forms of interaction in Multimedia: Video Conferencing, Elements of (immersive/non-immersive) Virtual Reality, Augmented Reality, Tele presence, Mobile technologies.
Multimedia Security: Overview- Multimedia Systems, Secured Multimedia, Digital Rights Management Systems and Technical trends, Multimedia Encryption and Digital Watermarking, Security Attacks and Multimedia Authentication. **(8 L)**

Learning Outcome

At the end of the course, Learning Outcomes Having successfully completed this course, the student will demonstrate:

1. Students will understand various multimedia tools available.
2. Students will be able to learn with Multimedia projects

3. Students can differentiate between lossy and lossless compression.

Text Book [TB]:

2. Tay Vaughan "Multimedia, Making IT Work" Osborne McGraw Hill,7th edition
3. Khalid sayood "Introduction to data compression" Morgan Kaufmann Publishers,3rd edition

Reference Book [RB]:

1. Buford "Multimedia Systems" Addison Wesley.,4th edition
2. Mark Nelson "Data Compression Book" BPB.,3rd edition
3. Sleinreitz "Multimedia System" Addison Wesley,5th edition

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	EC383	Subject Title	Consumer Electronics						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VII

Objectives of the Course: The students will learn

- Consumer Electronics and its application
- Concept of audio and video related system.
- Concepts of recording and power supplies.

UNIT-I

Audio Systems: Microphones, Loudspeakers, Speaker baffle and enclosure, Acoustics, Mono, Stereo, Quad, Amplifying Systems, Equalisers and Mixers, Electronic Music Synthesisers, Commercial Sound, Theater Sound System

8LU

UNIT – II

Video Systems and Displays: Monochrome TV, Colour TV standards and systems, TFT, Plasma, HDTV, Digital TV, Video Telephone and Video Conferencing **8L**

UNIT III:

Domestic Appliances: Washing machines, Microwave ovens, Air- conditioners and Refrigerators, In car computers Office Systems: FAX, Xerox, Telephone Switching System, Mobile Radio System

8L

UNIT IV:

Recording and Reproduction Systems: Disc recording and reproduction, Magnetic recording and reproduction, Video tape recording and reproduction, Video disc recording and play back, Distortion and Noise reduction in Audio and Video System **8L**

UNIT-V

Power Supplies and other systems: SMPS, UPS and Preventive Maintenance, Set Top Boxes, Remote controls, Bar codes, ATM **8L**

Text Books:

1. Consumer Electronics S P Bali Pearson ed 2005

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- Electronic systems related to consumer applications.
- Principle of working of various home appliances.
- Skills to use modern consumer electronics systems used in day to day life.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	EC385	Subject Title	Analog Electronics						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VII

Objectives of the Course: To teach the fundamental concepts of various electronic devices, circuits and their application. To develop ability among students for problem formulation, system design and solving skills.

UNIT-I

Semiconductor materials and properties Group-IV materials, Covalent bond, electron-hole concepts Basic concepts of energy bands in materials, concepts of forbidden gap Intrinsic and extrinsic semiconductors, donors and acceptors impurities **4L**

UNIT-II

Junction diode and diode applications p-n junction, depletion layer, v- i characteristics, diode resistance, capacitance diode ratings (average current, repetitive peak current, non-repetitive current, peak-inverse voltage). **4L**

Diode Applications Rectifiers (half wave and full wave), filter (C – filter), clipping circuits, clamping circuits, voltage multipliers **4L**

UNIT-III

Breakdown diodes Breakdown mechanisms (zener and avalanche), breakdown characteristics, zener diode application as shunt regulator **4L**

UNIT-IV

Bipolar Junction Transistor Basic construction, transistor action, CB, CE and CC configurations, input/output Characteristics, Transistor Amplifier Graphical analysis of CE amplifier, concept of voltage gain, current gain.

6L

UNIT-V

Field Effect Transistor

JFET: Basic construction, transistor action, concept of pinch off, maximum drain saturation current, input and transfer characteristics, characteristics equation CG, CS and CD configurations,
MOSFFT: depletion and enhancement type MOSFET-construction, operation and characteristics.

6L

Reference Books:

1. Boylestad and Nashelsky, 'erlectronic Decvices and circuits' PHI, 6e, 2001.
2. A Mottershead, 'Electronic devices and circuits'. PHI, 2000.

3. Morris Mano, 'Digital Computer Design', PHI, 2003.
4. R.K. Singh & Ashish, Basic Electronics Engg. Laxmi Publication, 2007.
5. Milman & Halkias, Integrated electronics Electronics, PHI, 2005.

OUTCOME OF THE COURSE:

- Students will be able to build, develop, model, and analyze the electronic circuits along with learning the device ratings and characteristics
- Students will be able to design and analyse electronic circuits

List of Experiments:

1. To study V-I characteristics of p-n junction diode.
2. To study V-I characteristics of zener diode.
3. To study half-wave rectifier and calculate ripple factor and efficiency.
4. To study full-wave rectifier and calculate ripple factor and efficiency.
5. To study clipper circuits.
6. To study clamper circuits.
7. To study the input and output characteristics of CB and CE transistor.
8. To study drain and transfer characteristics of JFET.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	ME342	Subject Title	Composite Materials						
LTP	30 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VII

Course Objective: To enable the students, know and understand the mechanical behavior of composite materials
Course Pre/Co- requisite (if any): Strength of Materials, Materials Engineering

Detailed Syllabus

UNIT 1:
Definition and applications of composite materials, classifications, Fibers- glass, carbon, ceramic and aramid fibers. Matrices- polymer, graphite, ceramic and metal matrices; characteristics of fibers and matrices. Fillers and whiskers. Advantages and limitations of composites

UNIT 2:
Mechanical behaviour of composite materials, surface treatment of fibers, thermosets matrix materials, Thermoplastics and other matrix materials, Manufacturing of thermoset composites, bag moulding, compression moulding, pultrusion, filament welding, other manufacturing processes

UNIT 3:
Composite mechanics Terminology, Behaviour of unidirectional composites, Behaviour of short fiber composites Analysis of orthotropic ply. Hook's Law for orthotropic lamina, Relation between Engg. constants and Elements of matrices for orthotropic ply, Transformation of Engg. constants, Failure in isotropic materials

UNIT 4:
Analysis of laminated composites, symmetric laminates, angle ply laminates, cross ply laminates, laminate, evaluation of lamina properties, determination of stress and strain in laminate, maximum stress and strain criteria, von Mises Yield criterion for isotropic materials, .

UNIT 5:
Residual stresses during curing, prediction of laminate failure, thermal analysis of composite laminates. Analysis of laminated plates - equilibrium equations of motion, static bending analysis, buckling analysis, free vibrations, natural frequencies.

Learning Outcome

At the end of the course the student can:
CO1:Have an overview of the mechanical behaviour and application of composite materials.
CO2:Get an overview of the methods of manufacturing composite materials
CO3: students will understand various mechanics of composite materials.

Text book [TB]:

1. Gibson R.F. Principles of Composite Material Mechanics, second edition, McGraw Hill, 1994.
2. Hyer M.W., Stress Analysis of Fiber- Reinforced Composite Materials, McGraw Hill, 1998.

Reference books [RB]:

1. F. L. Matthews, Rees D. Rawlings , Composite Materials: Engineering and Science Woodhead Publishing, 1999 - Composite materials.
2. Autar K. Kaw**,** Mechanics of Composite Materials,CRC Press, 30-May-1997

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	ME445	Subject Title	Total Quality Management						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VII

Course Objective: To facilitate the understanding of total quality management principles and processes.

Course Pre/Co- requisite (if any): Manufacturing Process, Industrial Engineering and Management

Detailed Syllabus

UNIT 1:

Introduction, need for quality, evolution of quality; Definitions of quality, product quality and service quality; Basic concepts of TQM, TQM framework, contributions of Deming, Juran and Crosby. Barriers to TQM; Quality statements, customer focus, customer orientation & satisfaction, customer complaints, customer retention; costs to quality.

UNIT 2:

TQM principles; leadership, strategic quality planning; Quality councils- employee involvement, motivation; Empowerment; Team and Teamwork; Quality circles, recognition and reward, performance appraisal; Continuous process improvement; PDCE cycle, 5S, Kaizen; Supplier partnership, Partnering, Supplier rating & selection.

UNIT 3:

The seven traditional tools of quality; New management tools; Six sigma- concepts, methodology, applications to manufacturing, service sector including IT, Bench marking process; FMEA- stages, types.

UNIT 4:

TQM tools and techniques, control charts, process capability, concepts of six sigma, Quality Function Development (QFD), Taguchi quality loss function; TPM- concepts, improvement needs, performance measures.

UNIT 5:

Quality systems, need for ISO 9000, ISO 9001-9008; Quality system- elements, documentation, Quality auditing, QS 9000, ISO 14000- concepts, requirements and benefits; TQM implementation in manufacturing and service sectors.

Learning Outcome

At the end of the course the student can:
CO1: To facilitate the understanding of total quality management principles and processes.
CO2: Student will learn about ISO systems
CO3: Student will learn about various quality tools to improve products quality.

Text book [TB]:

1. Besterfield D.H. et al., Total quality Management, 3rd ed., Pearson Education Asia, 2006.
1. Evans J.R. and Lindsay W.M., The management and Control of Quality, 8th ed., first Indian edition, Cengage Learning, 2012.
2. SubburajRamasamy, McGraw-Hill Education, 2012 - Total quality management.

REFERENCES [RB]:

1. Janakiraman B. and Gopal R.K., Total Quality Management, Prentice Hall India, 2006.
2. Suganthi L. and Samuel A., Total Quality Management, Prentice Hall India, 2006.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	PE481	Subject Title	Fuel Technology						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VII

1. Course Summary

This course will introduce students to classification of fuel and their properties. In this course, students unable to understand coal preparation, coal storage process, coal gasification process. This course also covers various topics which includes Fischer Tropsch Synthesis, Gaseous and liquid fuels i.e. natural gas, producer gas, water gas, coal gas, biogas, LPG, kerosene, diesel. Students will also learn combustion mechanism for solid, liquid and gaseous fuel.

2. Course Objectives

The students should be able to:

1. Understand different types of fuel, basic terms in fuels and combustion
2. Understand the coal preparation and conversion of coal into suitable products using gasification and Fishers Tropsch Synthesis process.
3. Understand physical and chemicals properties of different types of fuel and their storage techniques, combustion mechanism
4.

3. Course Outcomes

A good knowledge of this course will enable students to:

1. Understand origin of different of types of fuel and their properties and classification
2. Understand the Coal preparation and storage techniques, Physical and chemical properties of coal, Briquetting and liquefaction of solid fuels
3. Understand the conversion of coal into useful products using gasification techniques and Fischer Tropsch Synthesis
4. Understand about gaseous and liquid fuels, their physical and chemical properties and Testing methods for these fuels
5. Understand about combustion mechanism for different types of fuels and Furnace elements.

4. Curriculum Content

UNIT 1

Classification of Fuel- Solid Fuels, Liquid Fuels, Gaseous Fuels, Various Terms Related to the Study ofFuels and Combustion. Coal-Origin, Composition, Petrography,Analysis and Properties of Coal,Classification of coal

UNIT 2

Coal Preparation, Coal Storage, Coal Carbonization and by-product Recovery. Physical and Chemical, Properties of Coke.Briquetting of Solid Fuels. Liquefaction of Solid Fuels

UNIT 3

Coal: A Source of Energy- Gasification of Coal. Fixed Bed Gasification, Fluidized Bed Gasification,Entrained Bed Gasification. Integrated Gasification Combined Cycle (IGCC).Underground Gasificationof Coal. Indian Scenario related to Coal Gasification. Coal to Liquid (CTL) via Fischer – Tropsch (F-T)Synthesis.

UNIT 4

Gaseous and Liquid Fuels- Natural gas, Producer gas, Water gas, Carbureted Water gas, Coal gas, Gasesfrom biomass, LPG. Gasoline, Kerosene, Diesel.Physico Chemical Properties and Testing of LiquidFuels. Coal Tar Fuels (CTF).

UNIT 5

Combustion: General Principle of Combustion, Combustion of Solid Fuels – Grate Firing and Pulverized Fuel Firing System. Combustion of Liquid Fuels, Burners for Liquid and Gaseous Fuels Combustion

Text book [TB]:

1. **Kuo, K.K., Principles of Combustion, John Wiley and Sons, Inc. (2005).**
2. **Sarkar, S., Fuels and Combustion, Orient Longman, (1990).**

Reference books [RB]:

1. **Sharma, S.P., and Chander, M., Fuels and Combustion, Tata Mcgraw Hill (1984)**

5. Teaching and Learning Strategy

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	PE482	Subject Title	Health Safety and Environment in Industry						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VII

1. Course Summary

The course will introduce students to the need and scope of health, safety and environment in industry. The students will learn about the sources and causes of pollution, effects of the pollutants on livings and environment, and the safety and remedial measures that should be adopted to reduce the pollution.

2. Course Objectives

The students should be able to:

1. Understand the sources of pollutions.
2. Understand the effects of pollutions on health and environment.
3. Understand the remedial measures and safety precautions associated with each source of pollution.

3. Course Outcomes

On successful completion of the course, students have the understanding of the following:

1. Understand the scope of HSE in industry.
2. Understand the sources, effects and remedies of air pollution.
3. Understand the sources, effects and remedies of water pollution.
4. Understand the sources, effects and remedies of liquid and solid wastes.
5. Understand the sources, effects and remedies of noise pollution.

4. Curriculum Content

UNIT 1

Introduction: Man And Environment: Overview (Socio-Economic Structure & Occupational Exposures); Scope Of Environmental Engineering; Pollution Problems Due To Urbanization & Industrialization.

UNIT 2

Air Pollution : Causes Of Air Pollution; Types & Sources Of Air Pollutants; Climatic & Meteorological Effect On Air Pollution Concentration; Formation Of Smog And Fumigation; Analysis Of Air Pollutants Collection Of Gaseous Air Pollutants; Collection Of Particulate Pollutants; Analysis Of Air Pollutants Like : Sulphur Dioxide, Nitrogen Oxide, Carbon Monoxide, Oxidants &Ozone; Hydrocarbons; Particulate Matter; Control Of Particulate Emission- Control Of Gaseous Emission; Flue Gas Treatment Methods : Stacks Gravitational And Inertial Separation; Settling Chambers; Dynamic Separators; Cyclone; Filtration; Liquid Scrubbing; Spray Chambers; Packed Towers; Orifice And Venturi Scrubbers; Electrostatic Precipitators.

UNIT 3

Water Pollution & Its Control - Origin Of Waste Water – Types Of Water Pollutants And Their Effects ; Adverse Effects On: Human Health & Environment; Aquatic Life; Animal Life; Plant Life; Water Pollution Measurement Techniques; Water Pollution Control Equipments& Instruments; Indian Standards For Water Pollution Control.

UNIT 4

Liquid & Solid Wastes – Domestic & Industrial Wastes; Pesticides; Toxic: Inorganic & Organic Pollutants; Soil Deterioration; Ground Water Pollution; Concentration Of Infecting Agents In Soil; Solid Waste Disposal; Dumping Domestic & Industrial Solid Wastes; Advantages & Disadvantages; Incineration- Advantages & Disadvantages – Sanitary Land Field: Advantages & Disadvantages; Management Of Careful & Sanitary Disposal Of Solid Wastes.

UNIT 5

Noise Pollution & Control: Intensity; Duration; Types Of Industrial Noise; Ill Effects Of Noise; Noise Measuring & Control; Permissible Noise Limits.

Text book [TB]:

1. J. Turk & A. Turk, "Environmental Science Environmental Pollution".

Reference books [RB]:

1. Odum, "Fundamental of Ecology.

5. Teaching and Learning Strategy

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	MA541	Subject Title	STATISTICAL TECHNIQUE AND APPLICATIONS						
LTP	3 0 0	Credit	3	Subject Category	Open Elective	Year	4th	Semester	VII

OBJECTIVE: The objective of this subject is to give the basic knowledge of descriptive and mathematical part of statistics. Applications of various probability distribution in the field of insurance and finance. The course will focus on the different situations in the field of actuarial science which can be dealt with transformation of variables. The course will make able the students to understand the association between two random quantities and to find their mathematical measure.

Unit I

Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, absolute moments, factorial moments, skewness and kurtosis, Sheppard's corrections.

Unit II

Bivariate data: Definition, scatter diagram, simple, partial and multiple correlation, rank correlation. Simple linear regression.

Unit III

Principle of least squares and fitting of polynomials and exponential curves. Theory of attributes Independence and association of attributes, consistency of data, measures of association and contingency, Yule's coefficient of colligation.

Unit IV

Testing of hypothesis: Z-test, t-test, F-test, Chi-square test for goodness of fit, Introduction to analysis of variance.

LEARNING OUTCOME: Students will able to:

- Analyze given statistical data.
- Have confidence to deal with real life situation, especially, in insurance and finance.
- Understand applications of standard probability distributions in every span of life.
- Find the association between two random quantities using mathematical theory.

Text Books:

1. Gupta, S.C. and Kapoor, V.K. (2007): Fundamental of Mathematical Statistics, 11thEdition. (Reprint), Sultan Chand & Sons.
2. Y.P. Agarwal (2012) Statistical Methods: Concepts, Application and Computation, 3rd edition; Sterling Publishers.

Reference Books:

3. Freund E F John, Mathematical statistics, 6th edition, Prentice Hall International, 1999.
4. Hogg, R. V. and Craig, T. T. (1978) Introduction to Mathematical Statistics (Fourth Edition) (Collier-McMillan).
5. Rohatgi, V. K. (1988) Introduction to Probability Theory and Mathematical Statistics (Wiley Eastern).

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Code	AR-481	Subject Title	GRAPHICS & PRODUCT DESIGN						
LTP	3 0 0	Credit	3	Subject Category	OE	Year	4th	Semester	VII

Course Objective:

To introduce the various aspects og graphics design and important stages of product design and development.

Unit 1: Introduction

Introduction and importance of graphics and product design.Principles and elements of design. History of Design.Colour Theory. Techniques and processes to communicate graphically.

Unit 2: Product Design Cycle

Stages of product development. Introduction to ergonomics

Unit 3: Design Process

Introduction to concept. Concept development. Role of sketching in concept development. Implementation stages of concept for product development

Unit 4: Technology & Market Assessment

Customer needs identification, Market research essentials. Advertising and marketing tools.

Unit 5: Design Tools

Introduction to various design tools.

LEARNING OUTCOME:

1. The student will be able to understand the importance of Graphics.
2. The students will be able to understand and demonstrate their ideas visually.
3. The students will be able to understand the various stages of product development.

Text Books:

1. The Elements of Graphic Design, Alex W. White
2. The Design of Everyday Things, Don Norman

Reference Books:

1. Product Design & Development, Karl T. Ulrich & Steven D. Eppinger

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	ME381	Subject Title	Entrepreneurship and Startup						
LTP	2 0 2	Credit	3	Subject Category	UC	Year	4th	Semester	VII

COURSE OBJECTIVE:

To understand the basic concepts Entrepreneurship and start up. To understand role and importance of entrepreneurship for economic development. To develop personal creativity and entrepreneurial initiative or start up.

COURSE OUTCOME

At the end of the course the student can:

CO1: Analyse the business environment in order to identify start up opportunities
CO2: Identify the elements of success of entrepreneurial ventures
CO3: Consider the legal and financial conditions for starting a start up
CO4: Evaluate the effectiveness of different entrepreneurial strategies

Unit 1: 4Hrs.

Conceptual definition of entrepreneurs, entrepreneurship and start up. Historical development of entrepreneurship. Entrepreneurship in economic theory. Entrepreneurial practice. Impact of Entrepreneurship on society. The role of entrepreneurship in economic development. Role of innovation in entrepreneurship.

Unit 2: 6Hrs.

Entrepreneurial economy. Entrepreneurship and Economic Development. Type of Entrepreneurship. Entrepreneur and small business. Features and types of entrepreneurs. Terms of entrepreneurship. Sources of business ideas. Technical and technological analysis of entrepreneurial projects. Designing a business investment. Angel Investor and Venture capitalist – Roles and Importance.

Unit 3: 5Hrs.

Forms of entrepreneurial organization. Entrepreneurial process. Entrepreneurial and start-up strategies. Role of Government agencies in Entrepreneurship development. Entrepreneurial project: entrepreneurial venture and entrepreneurial development chain. Knowledge of business economy. Group based strategies development.

Unit 4: 5Hrs.

Sources of capital. Market Research, Understanding the Market need for your concept. Defining the business concept and formulating a business plan for startup. Fundamentals of entrepreneurial management. Business process: product design, operational art, stock management.

Unit 5: 6Hrs.

Entrepreneurbiographies - the actual successes and failures. Exit strategies for entrepreneurs. Case studies of : Successful Entrepreneurial Ventures, Failed Entrepreneurial Ventures and Turnaround Ventures. Some case studies related to Product & Technology.

TEXT BOOKS:

1. S.S.Khanka, "Entrepreneurial Development". S.Chand & Co. Ltd.,10th edition, 2014.
2. Kuratko & Hodgetts, "Enterprenuership –Theory, process and practices", Thomson learning 6th edition, 2016.
3. Donald F Kuratko, "Entreprenuership – Theory, Process and Practice", 9th Edition, Cengage Learning 2014.

REFERENCE:

1. Hisrich R D and Peters M P, "Entrepreneurship". Tata McGraw-Hill. 9th Edition, 2014.

2. Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, 1998.
3. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development" Institute of India, Ahmadabad, 1986.
4. Rajeev Roy, 'Entrepreneurship' 2nd Edition, Oxford University Press, 2011.
5. Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis" 2nd Edition Dream Tech, 2005.

EVALUATION BREAKUP:

- Case study – 25 Marks (Internal)
- Assignments – 10 Marks (Internal)
- Mid Term Evaluation of Project – 10 Marks (Internal)
- Startup Idea, Seminar - 15 Marks (External)
- End Term Evaluation of Project – 40 Marks (External)

*The End Term evaluation will consist of 25 to 30 minutes' presentation followed by questionnaire by External Experts.

RESOURCE PERSONS FROM VARIOUS DEPARTMENTS:

- Mechanical Engineering
- MBA
- Computer Science Engineering.
- Information Technology.
- Industry Persons.
    1. Experts from Industry – As recommended by STPI
    2. Dr Umakant Panwar – Entrepreneur
    3. Mr Vivek Harinarian - Entrepreneur.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Humanities Electives III

Subject Code	HS493	Subject Title	Indian Culture & Tradition						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	IV	Semester	VIII

Course Objective

- To promote an integral and holistic growth of young minds
- Develop a broad understanding of Indian society and intercultural literacy through cultural immersion.
- Deepen your knowledge of Indian development, environmental, and cultural issues through coursework, local engagement, and independent projects.

Unit 1Indian Culture: An Introduction **8Hrs.**

Characteristics of Indian culture, Significance of Geography on Indian Culture; Society in India through ages- Ancient period- Varna and Caste, family and marriage in India, position of women in ancient India, Contemporary period; caste system and communalism.

Unit 2 Indian Languages and Literature **6 Hrs.**

Evolution of script and languages in India: Harappan Script and Brahmi Script;Short History of the Sanskrit literature: The Vedas, The Brahmins and Upanishads & Sutras, Epics: Ramayana and Mahabharata & Puranas.

Unit 3 Brief History of Indian Arts and Architecture **6Hrs.**

Indian Art & Architecture: Gandhara School and Mathura School of Art; Hindu Temple Architecture, Buddhist Architecture, Medieval Architecture and Colonial Architecture.

Indian Painting Tradition: ancient, medieval, modern Indian painting and Odishan painting tradition *Performing Arts:* Divisions of Indian classical music: Hindustani and Carnatic, Dances of India: Various Dance forms: Classical and Regional, Rise of modern theatre and Indian cinema.

Unit 4 Spread of Indian Culture Abroad **6Hrs.**

Causes, Significance and Modes of Cultural Exchange - Through Traders, Teachers, Emissaries, Missionaries and Gypsies,Indian Culture in South East Asia India, Central Asia and Western World through ages

COURSE OUTCOME:

- Understand background of our religion, customs institutions, administration and so on.
- Understand the present existing social, political, religious and economic conditions of the people.
- Analyze relationship between the past and the present relevance of Indian tradition.
- Develop practical skills helpful in the study and understanding of historical events.

TEXT BOOKS

1.Chakravarti, Ranabir: Merchants, Merchandise & Merchantmen, in: Prakash, Om (ed.): The Trading World of the Indian Ocean, 1500-1800 (History of Science, Philosophy and Culture 361 in Indian Civilization, ed. by D.P.Chattopadhaya.

2. Chaudhuri, Kirti N.: Trade and Civilisation in the Indian Ocean, CUP, Cambridge, 1985.

3.Malekandathil, Pius: Maritime India: Trade, Religion and Polity in the Indian Ocean, Primus Books, Delhi, 2010.

4. McPherson, Kenneth: The early Maritime Trade of the Indian Ocean, in: ib.: The Indian Ocean: A History of People and The Sea, OUP, 1993, pp. 16-75.

5. Christie, J.W., 1995, State formation In early Maritime Southeast Asia, BTLV

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Humanities Electives III

Subject Code	**HS483**	**Subject Title**	**Indian Philosophy**					
LTP	**2-0-0**	**Credit**	2	**Subject Category**	Elective	**Year**	**IV**	**Semester**	VIII

Course Objective

- Develop an understanding of Indian philosophical systems
- To empower for self-exploration

Unit 1 Introduction **11Hrs.**

Meaning of Philosophy, Origin of Philosophy in India, Major Indian philosophical systems: Sankhya: Metaphysics, Theory of causation, Prakriti, Purusha, Evolution, Yoga: Concept of Chitta, Types and Modification of Chitta, Eight-fold Yoga & Vedant: Notions of Maya & Brahma

Unit 2 Major Principles **5Hrs.**

Panchkosha, Triguna, Tridosh, Macrocosm-Microcosm

Unit 3 Major Contemporary Indian Philosophers **6Hrs.**

Lord Buddha, Mahaveer, Gandhi, Vivekanand, Aurovindo-The Life Divine, Pt. Sri Ram Sharma Acharya, Vinoba & Acharya Rajneesh Osho, Paramhans Yogananda-Autobiography of a Yogi

Unit 4 Activities & Projects **4Hrs.**

Identifying human prakriti, Using Trigun inventory, Understanding self

COURSE OUTCOME:

- Students will acquire understanding of concepts of Indian philosophy.
- Students will be enabled to analyze their self.
- The students will be able to relate some of the core concepts and theories of modern Indian philosophy to concepts and ideas in classical Indian philosophy.
- The students will be able to appreciate how philosophical approaches may be integrated more practically as a “way of life”.

TEXT BOOK

Chattejee,S.G. and Datta, D.M. (1960) An Introduction to Indian Philosophy, Calcutta: University of Calcutta Press

EFERENCE BOOKS

- The Yoga Sutras of Patanjali: (annoted commentary) (Divine Cool Breeze Realized Writers Book 15) by Shri Patanjali, Shri Mataji Nirmala Devi (Introduction), Charles Johson (Translation)
- Acharya, Pt. Shri Ram Sharma (2015). Gayatri Mahavigyan. Mathura:Akhand Jyoti Prakashan.
- Vinoba, Acharya (2011). Vichar Pothi. Pawnar: Paramdham Prakaashan.
- Gandhi, M.K. (2013). The story of my experiments with truth. Varanasi: Sarvodaya Prakashan.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Humanities Electives III

Subject Code	HS491	Subject Title	Industrial Sociology						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	IV	Semester	VIII

Course Objective

- The course attempts to analyze the structure and process of industrial organizations from the sociological perspective.
- The course enables students to have a general view of modern industry.

Unit 1 **7Hrs.**

Industrial Sociology: Nature, Scope and Importance, Origin and Development, Industry as a social, System,Development of Industry in Post-Independence period, Evolution of Working Class, Changing nature of work, Growth of unorganized informal sector., Dynamics of Industrial Relations: Approaches to the study of Industrial Relations, Collective Bargaining,– Concepts, Types, Scope and Importance.

Unit 2 **7Hrs.**

Industrial Disputes: Concept, Features and Kinds of disputes, Settling disputes, Mediation, Arbitration, Conciliation, Negotiation,The Indian Worker: Features of Indian worker, the contribution of social - Philosophy, family, caste and community in determining the attitude of workers

Unit 3 **6Hrs.**

Trade Union: Concept, Features, Functions and Types, History of Trade Union Movement in India Trade Unions and Challenges of Privatization and Globalization; Law and work, Decline of Trade Unions.

Unit 4 **6Hrs.**

Dynamics of Industrial Relations: Corporate Social Responsibility, Inclusion of Women in the Corporate Sector, Scope of Industrial Sociology in India; Impact on Employment, Impact on HRD, impact on wages and benefits, Modern Industry in India

COURSE OUTCOME:

- It will enable students to demonstrate the different human components that make up modern industry.
- The student will get exposed to a specialized area of sociology and its insights.
- Apply sociological concepts and theories to understand contemporary social issues and/or public debates about these issues
- Communicate sociological concepts and/or research in a manner that is appropriate for the intended audience (e.g., academic, lay audience)

TEXT BOOKS

1. Davis, Keith, 1984. Human Behaviour at work, New Delhi. Mcgraw Hill.
2. Gisbert, Ascual S J 1972. Fundamentals of Industrial Sociology, New Delhi, Tata Mc Graw-Hill.
3. Ramaswamy, E. A, 1978. Industrial Relations in India. Delhi. MacMillian
4. Pascal Gilbert: Fundamental of Industrial Sociology; Orient-Longman.
5. E.V.Schneider – Industrial sociology
6. Baviskar et al - Social Structure and Change [Vol.IV] Sage Publishers

REFERENCE BOOKS

- Sheth, N R, 1979, Industrial Sociology in India, Jaipur Rawat.
- Dutt and Sundharam 2007. Indian Economy, S Chand Publications. New Delhi: Publications.
- P. Subha Rao: Human Resource Management and Industrial Relations – Himalaya Publishing House

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Humanities Electives III

Subject Code	HS485	Subject Title	Sustainable Development						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	IV	Semester	VIII

Course Objective

- To provide the overview of sustainable and its needs to the students.
- To provide the importance and components of sustainable development to the students.
- To provide the association of social and economic development to the students.

Unit 1 Overview of Sustainable Development **5 Hrs.**

History and emergence of the concept of Sustainable Development, Components of SD i.e. Economic, Social, Human, Institutional, Technological and Environmental development; Definitions, Sustainability in Ecosystem Services; natural resource degradation, greenhouse gases, factors affecting SD (i.e. Industrialization, urbanization, population growth, globalization, etc.)

Unit 2 Polices on Sustainable Development at international level **4Hrs.**

Government Policies for SD in India; Socio-economic policies for sustainable development in India, Sustainable development through trade, Carrying Capacity, global policies for sustainable development

Unit 3 Sustainable Development and International Contribution **10 Hrs.**

SDGs and MDGs, Complexity of growth and equity, International Summits, Conventions, Agreements, Initiations of international organizations like WHO, UNDP, WTO, FAO and World Bank towards sustainable development

Unit 4 Measurement of Sustainable Development **7Hrs.**

Role of developed and developing countries in the sustainable development, Demographic dynamics and sustainability, integrated approach for resource protection and management; Index based estimation of SD i.e. Environmental Sustainable Development Index and sustainable development, and other index

Course Outcome:

- The students will be able to understand the importance of natural resource in economic development.
- The students contribute significant efforts towards sustainable development
- Develop a future-oriented perspective that highlights the significance of their decisions, choices and actions on the quality of life of present and future generations.
- Understand and are empowered to address the real causes and consequences of unsustainable behaviour within the context of an interdependent and globalised world.

TEXT BOOK

The Sustainability Revolution: Portrait of a Paradigm Shift by Edwards, Andres R., New Society Publishers, 2005.

REFERENCE BOOKS

6. The Sustainability Revolution: Portrait of a Paradigm Shift by Edwards, Andres R., New Society Publishers, 2005.
7. Sustainable development in India: Stocktaking in the run up to Rio+20: Report prepared by TERI for MoEF, 2011.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE444	Subject Title	COMPUTER METHODS IN POWER SYSTEM ANALYSIS						
LTP	2 0 2	Credit	3	Subject Category	Electives	Year	4th	Semester	VIII

Objectives of the Course

- To have knowledge about methods used for modeling of network and methods used for its analysis
- To study about methods used for short circuit analysis of a power system
- To study techniques used for forecasting of load both long term and short term

Unit 1	**Network Modeling**: - Impedance and Admittance representation. Power flow analysis – Gauss Siedel method, Newton Raphson method – DLF and FDLF method, DC Load flow, sparsity oriented programming, Optimal Power Flow Analysis	**8L**
Unit 2	**Short Circuit Analysis: -** SCA of multi node system using bus impedance matrix, Z-bus building algorithm, asymmetrical fault analysis using Z-bus, development of voltage and current equations under asymmetrical fault using symmetrical components.	**8L**
Unit 3	**Load Forecasting Techniques:-** Methods of Load Forecasting	**8L**
Unit 4	**Contingency Analysis**:- Power systems State estimation and various techniques like LSET & WLSET, The line power flow state estimation.	**8L**
Unit 5	**Computer Control of Power System:-** Need of real time and computer control of power system, Operating states of power system, SCADA & Energy Management Centers, Smart Grid.	**8L**

Text Books:

1. Glonn N. Stagg and Aimed H. El-abiad, "Computer Method in Power System Analysis", McGraw Hill, International edition 1988.
2. George L. Kusic, "Computer Aided Power System Analysis", Prentice Hall, 1986.

Reference Books

1. J. Arrillage, C.P. Amold and S. J. Harker, "Computer Modeling of Electrical Power Systems", John Wiley and Sons 1983.
2. Jos Arrillaga and Bruce Smith, "AC-DC Power System Analysis", IEE London UK, 1998.
3. L.P. Singh, "Advanced Power System Analysis and Dynamics", New Age International Ltd, New Delhi, 1992.
4. Hadi Sadat, "Power System Analysis", Tata McGraw Hill, New Delhi, 1999.
5. Mariesa Crow, "Computational methods for Electrical Power Systems", CRC press.

Outcome of the Course:

- A student is able to model a power system network and analyze it using different analysis methods
- A student is able to do short circuit analysis of a power system
- A student is able to do short circuit analysis and able to to do load forecast both long term and short term

List of Experiments

1. To plot the daily load curve for the given data using MATLAB
2. Introduction to basics of Electrical Transients Analyser Program (ETAP)
3. Evaluate the value of voltages for a 4 bus system using node equations in MATLAB
4. Modeling and Load flow analysis of 5 bus system
5. Bus elimination of a 4 bus system using MATLAB
6. Application of Gauss-Siedel and Newton-Raphson method for load flow studies on a three bus system using MATLAB
7. Analysis of fault for a multibus system using bus impedance matrix
8. Load flow analysis using Gauss-Siedel and Newton-Raphson method for 5 bus system

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE445	Subject Title	POWER SYSTEM DEREGULATION						
LTP	3 0 0	Credit	3	Subject Category	Electives	Year	4th	Semester	VIII

Objectives of the Course

- The objectives of the course are to make the student understand the concept of reliability,
- To make the student understand about energy policy, demand side management,
- To make the student understand about power exchange, trading arrangements and different pricing structure

Unit 1	**General:** Electricity demand operation and reliability, energy policy and cost, competitive market for generation, role of the existing power industry, renewable generation technologies, distributed generation, traditional central utility model, independent system operator (ISO), retail electric providers.	**8L**
Unit 2	**Electricity Market and Management:** Wholesale electricity markets, characteristics, bidding market clearing and pricing, ISO models, market power evaluation, demand side management, distribution planning.	**8L**
Unit 3	**Power Pool:** Role of the transmission provider, multilateral transaction model, power exchange and ISO- functions and responsibilities, classification of ISO types, trading arrangements, power pool, pool and bilateral contracts, multilateral traders.	**8L**
Unit 4	**Electricity Pricing-I:** Transmission pricing in open access system, rolled in pricing methods, marginal pricing methods, zonal pricing, embedded cost recovery, open transmission system operation and congestion management in open access transmission systems in normal operation.	**8L**
Unit 5	**Electricity Pricing-II**: Predicting electricity costs, electricity cost derivation, electricity pricing of inter provincial power market, transmission policy.	**8L**

Text Books:

1. L.L. Loi*: Power System Restructuring and Deregulation-Trading, Performance and Information Technology, John Wiley & Sons.

Reference Books

1. C.S. Frd, C.C Michael, D.T Richard and E.B. Roger: Spot Pricing of Electricity, Kluwer Academic Publishers
2. I. Marija, G. Francisco and F. Lester: Power System Restructuring: Engineering and Economics, Kluwer Academic Publishers

Outcome of the Course:

- Use various models for electrical supply such as central pool model, independent model etc.
- Use benefits of deregulation for efficient energy management.
- Converse with the concept of power exchanges for trading arrangement.
- Converse with different pricing methods for various conditions.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE446	Subject Title	RELIABILITY ENGINEERING						
LTP	3 0 0	Credit	3	Subject Category	Electives	Year	4th	Semester	VIII

Unit 1	**Introduction:** Definition of reliability, types of failures, definition and factors influencing system effectiveness, various parameters of system effectiveness.	**8L**
Unit 2	**Reliability Mathematics :** Definition of probability, laws of probability , conditional probability, Bay's theorem; various distributions; data collection, recovery of data, data analysis procedures, empirical reliability calculations	**8L**
Unit 3	**Reliability:** Types of system- series, parallel, series parallel, stand by and complex; development of logic diagram, methods of reliability evaluation; cut set and tie-set methods, matrix methods event trees and fault trees methods, reliability evaluation using probability distributions, Markov method, frequency and duration method.	**8L**
Unit 4	**Reliability Improvements:** Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance.	**8L**
Unit 5	**Reliability Testing:** Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.	**8L**

Text Books:

1. R.Billintan & R.N. Allan,"Reliability Evaluation of Engineering and Systems", Plenum Press.

Reference Books

1. K.C. Kapoor & L.R. Lamberson,"Reliability in Engineering and Design", John Wiely and Sons.
2. S.K. Sinha & B.K. Kale,"Life Testing and Reliability Estimation", Wiely Eastern Ltd.
3. M.L. Shooman, "Probabilistic Reliability, An Engineering Approach", McGraw Hill.
4. G.H.Sandler,"System Reliability Engineering", Prentice Hall.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE447	Subject Title	POWER SYSTEM OPERATION & CONTROL						
LTP	3 1 0	Credit	4	Subject Category	Electives	Year	4th	Semester	VIII

Objectives of the Course

- To provide students the knowledge of optimization techniques used in the power system and Load Frequency Control (LFC).
- To provide a solid foundation in mathematical and engineering fundamentals required to control the governing system in Turbine models.
- To provide the knowledge of Hydrothermal scheduling, reactive power control.

Unit 1	**Introduction:** Structure of power system, power system control center,level decomposition in power system, power system security, various operational stages of power system, power system voltage stability, introduction to SCADA	**8L**
Unit 2	**ECONOMIC operation:** Concept and problems of unit commitment, input output characteristics of thermal and hydroplants, system constraints, Optimal operation of thermal units without and with transmission losses, penalty factor, incremental transmission loss, transmission loss formula (without derivation), hydrothermal scheduling long and short terms, concept of optimal power flow	**8L**
Unit 3	**Load frequency control:** Concept of load frequency control, load frequency control of signal area system: turbine speed governing system and modelling, block diagram representation of single area system, steady state analysis, dynamic response control area concept, P-I control, load frequency Control and economic dispatch control. Load frequency control of two area system tie line power modelling, block diagram representation of two area system,	**8L**
Unit 4	**AUTOMATIC voltage control:** Schematic diagram and block diagram representation, Different type of excitation system & their controllers. Concept of voltage control, methods of voltage control, control by tap changing transformer. Shunt compensation, series compensation, phase angle compensation	**8L**
Unit 5	**Fact Devices:** Concept and objectives of facts controllers, Introduction to different FACT controllers like TCR, FC-TCR,TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC	**8L**

Text Books:

1. D.P. Kothari & I.J. Nagrath, "Modern Power System Analysis" Tata Mc Graw Hill, 3rd edition.
2. P.S.R. Murty, "Operation and Control in Power Systems" B.S. publications

Reference Books

1.N.G. Hingorani & l. Gyugyi, "Understanding Facts “Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Publications
2. A.J. Wood & B.F. Wollenburg, "Power Generation, Operation and Control ", John Wiley & Sons
3. O.J. Elgerd,"Electric Energy System Theory”, Tata Mc Graw Hill.
4. P. Kundur, "Power System Stability and Control”, Mc Graw Hill.
5. M.H. Rashid, "Power Electronics: Circuits, Devices and Applications "Prentice Hall of India”, 3rd edition.
6. T.K. Nagsarkar & M.S. Sukhija, “Power System Analysis”, Oxford University Press

Outcome of the Course:

- **To make students understand Economic operation of power system and importance of LFC control.**
- **To allow students discuss about thermal and hydro power plants operation in meeting the load demand optimally.**
- **To improve student’s ability in solving problems (numerical problems at present)**
- **Ability to discuss single area load frequency control and two area load frequency control.**
- **Ability to model and design turbine and Automatic controller.**

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE448	Subject Title	POWER SEMICONDUCTOR CONTROLLERS						
LTP	3 0 2	Credit	4	Subject Category	Electives	Year	4th	Semester	VIII

Objectives of the Course

- To give the exposure to types of power supplies
- To give the exposure to types of resonant converter used in real world applications
- To analyze and gain knowledge about practical exposure and applications of different power electronic controllers.

Unit 1	**Power Supplies:** Introduction, ac power supplies: power quality, power supply protection, power conditioners, uninterruptible power supplies; dc power supplies: comparison of linear and switched-mode power supplies, dc to dc converters with electrical isolation: forward, push-pull and bridge converter, SMPS.	**8L**
Unit 2	**Resonant Converters:** Switched-mode inductive current switching, significance of ZVS and ZCS, classification of resonant converters, series and parallel load resonant converters, class-E converters, ZCS/ZVS resonant switch converters and their switch configurations, resonant dc link converters and their circuit configurations.	**8L**
Unit 3	**Analysis and simulation of Power Electronic Circuits:** Analysis of simple power electronic circuits with RL, RC and RLC type loads and dc / sinusoidal sources; performance of transformers for high frequency applications, computer simulation of power electronic devices and systems.	**8L**
Unit 4	**Recent Power Semiconductor Devices:** Recent advances in power devices and their relative merits, power modules, protection of devices and converters, heat management.	**8L**
Unit 5	**Applications of Different Controllers :**Three-phase ac regulators, multiple converters, application of different converters in solar and wind energy systems as well as in dispersed generation, current trends in power electronics.	**8L**

Text Books:

1. M. H. Rashid (Editor), Power Electronics Handbook, Academic Press, California.

Reference Books

1. N. Mohan, T.M. Undeland and W.P. Robins, Power Electronics, John Wiley, Singapore, 3rd ed.
2. M. H. Rashid, Power Electronics, PHI Learning, 3rd ed, New Delhi.
3. G.K. Dubey et al, ThyristorisedPower Controllers, New Age International, New Delhi.

Outcome of the Course:

- **Develop their own program to solve their own problem and use this program to solve similar problems later on.**
- **Develop simulink model of the given system.**

List of Experiments **MATLAB/PSIM Based**

1. To simulate and analyze push-pull converters
2. To simulate and analyze bridge converter
3. To simulate and analyze series load resonant converter
4. To simulate and analyze parallel load resonant converter
5. To analyze and simulate RL type load electronic circuit
6. To analyze and simulate RLC type load electronic circuit
7. To simulate three phase ac regulator
8. To design and simulate converter for solar plant connected to grid
9. To design and simulate converter for wind plant connected to grid

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE449	Subject Title	EHV A.C. & D.C. TRANSMISSION						
LTP	3 1 0	Credit	4	Subject Category	Electives	Year	4th	Semester	VIII

Objectives of the Course

- Understand the need of EHV AC transmission and various issues related with it
- Reactive power management, Stability of AC and DC systems
- In depth converter analysis, faults, protections, harmonic considerations, grounding system

Unit 1	**Introduction:** Need of EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC & DC transmission, Types of tower	**8L**
Unit 2	**EHV AC Transmission:** Corona loss formulas, corona current, audible noise- generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferroresonance, reduction of switching surges on EHV system.	**8L**
Unit 3	**Extra High Voltage Testing:** Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers. Consideration for Design of EHV Lines, Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.	**8L**
Unit 4	**EHV DC Transmission-I**: Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters, principle of dc link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of dc link.	**8L**
Unit 5	**EHV DC Transmission- II:** Converter faults, protection against over currents and over voltage, HVDC Circuit breakers, Smoothing reactors, generation of harmonics, ac and dc filters, multi – terminal dc systems (MTDC): Types, control, protection and application.	**8L**

Text Books:

1. R.D. Begamudre, “Extra High Voltage AC Transmission Engineering “Wiley Eastern
2. K.R Padiyar,”HVDC power transmission System, Technology and System Reactions “new age international.

Reference Books

1. M.H Rashid,”Power Electronics: Circuit, Devices and Applications”, Prentice hall of India.
2. S .Rao, “EHV AC & HVDC Transmission Engineering and practice”, Khanna Publishers
3. J Arrillaga,”High Voltage Direct current Transmission”, IFFE Power Engineering Series 6, Peter Peregrionus Ltd. London.
4. M.S Naidu & V.K Kamaraju “High Voltage Engineering”, Tata Mc Graw Hill.

Outcome of the Course:

- Student will be able to demonstrate the knowledge of Power handling capacity of different Transmission systems
- Effect of Electrostatic and electromagnetic fields and corona due to EHVAC lines.
- Voltage control and current control systems for power flow controls in HVDC system.
- The knowledge of AC filters as well as DC filters and Reactive power compensation
- Overall knowledge about the HVDC system such as MTDC, protection and substation layout of HVDC power plant

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE450	Subject Title	LINE COMMUTATED AND ACTIVE PWM RECTIFIERS						
LTP	3 0 0	Credit		Subject Category	Electives	Year	4th	Semester	VIII

Objectives of the Course

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Unit 1	**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.	**6L**
Unit 2	**Diode rectifiers with passive filt**ering 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.	**6L**
Unit 3	**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.	**6L**
Unit 4	**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.	**6L**
Unit 5	**Ac-dc bidirectional boost converte**r 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. 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.	**16L**

Text Books:

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”, Addison-Wesley, 1991.

Reference Books

L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.
2. N. Mohan and T. M. Undeland, “Power Electronics: Converters, Applications and Design”, 3. John Wiley & Sons, 2007.
4.. R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science & Business Media, 2001.

Outcome of the Course:

- **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.**

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE451	Subject Title	ENERGY MANAGEMENT SYSTEM						
LTP	3 0 2	Credit	4	Subject Category	Electives	Year	4th	Semester	VIII

Objectives of the Course

- Understand the fundamentals of energy management functions
- Understand the economic analysis and system energy management for electrical system and equipment.
- Enhance the knowledge in SCADA.

Unit 1	**SCADA**: Purpose and necessity, general structure, data acquisition, transmission & monitoring. General power system hierarchical Structure. Overview of the methods of data acquisition systems, commonly acquired data, transducers, RTUs, data concentrators, various communication channels- cables, telephone lines, power line carrier, microwaves, fiber optical channels and satellites.	**8L**
Unit 2	**Supervisory and Control Functions:** Data acquisitions, status indications, majored values, energy values, monitoring alarm and event application processing. Control Function: ON/ OFF control of lines, transformers, capacitors and applications in process in industry - valve, opening, closing etc.	**8L**
Unit 3	**Regulatory functions:** Set points and feedback loops, time tagged data, disturbance data collection and analysis. Calculation and report preparation. **MAN- Machine Communication:** Operator consoles and VDUs, displays, operator dialogues, alarm and event loggers, mimic diagrams, report and printing facilities.	**8L**
Unit 4	**Data basis-** SCADA, EMS and network data basis. SCADA system structure - local system, communication system and central system. Configuration- NON-redundant- single processor, redundant dual processor. Multicontrol centers, system configuration. Performance considerations: real time operation system requirements, modularization of software programming languages.	**8L**
Unit 5	**Energy Management Center:** Functions performed at a centralized management center, production control and load management economic dispatch, distributed centers and power pool management.	**8L**

Text Books:

1. Torsten Cergrell, " Power System Control Technology", Prentice Hall International.
2. George L Kusic "Computer Aided Power System Analysis",, Prentice Hall of India,

Reference Books

1. A. J. Wood and B. Woolenberg, "Power Generation Operation and Control", John Wiley & Sons.
2. Sunil S Rao, "Switchgear Protection & Control System" Khanna Publishers 11 th Edition.

Outcome of the Course:

- **Understand the fundamentals of energy management functions**
- **Understand the economic analysis and system energy management for electrical system and equipment.**
- **Expose to the concept of supervisory control and data acquisition.**
- **Familiarize the application of SCADA in power systems**

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	EE452	Subject Title	ELECTRICAL ENERGY CONSERVATION AND AUDITING						
LTP	3 0 0	Credit	3	Subject Category	Electives	Year	4th	Semester	VIII

Objectives of the Course

Unit 1	**Energy Scenario :** 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.	**6L**
Unit 2	**Basics of Energy and its various forms** Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion.	**7L**
Unit 3	**Energy Management & Audit**: Definition, energy audit, need, types of energy audit. Energy management (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.	**6L**
Unit 4	**Energy Efficiency in Electrical System**s Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. 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.	**7L**
Unit 5	E**nergy Efficiency in Industrial Systems:** Compressed Air System: Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment, leakage test, factors affecting the performance and savings opportunities in HVAC, Pumps and Pumping System: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities., Cooling Tower: Types and performance evaluation, efficient system operation, flow control strategies and energy saving opportunities, assessment of cooling towers. **Energy Efficient Technologies in Electrical Systems :**Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.	**14L**

Text Books:

1. S. C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991.

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)

Outcome of the Course:

- **Understand the current energy scenario and importance of energy conservation.**
- **Understand the concepts of energy management.**
- **Understand the methods of improving energy efficiency in different electrical systems.**

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS471	**Subject Title**	**Data Base Administration** *(Departmental Elective 8/9)*					
LTP	2 0 2	**Credit**	3	**Subject Category**	DE	**Year**	4th	**Semester**	VIII

OBJECTIVES:

The objective of this course is to provide the necessary knowledge and understanding the concepts of Oracle architecture components along with the overview of Storage Structure and Relationships

UNIT I Introduction (8 L)

Oracle Architectural Components, Getting Started With Oracle Server , Managing an Oracle Instance, Creating a Database, Data Dictionary Contents and Usage, Maintaining the Control File, Redo Log Files, Managing Tablespaces and Data Files, Storage Structures and Relationships, Managing Undo Data, Tables, Indexes, Maintaining Data Integrity, Managing Password, Managing Security, Resources, users, Privileges & Roles, Loading Data Into a Database & Globalization Support

UNIT II DBA Fundamentals (9 L)

Networking Overview, Basic Oracle Net Architecture, Server-Side Configuration, Basic Oracle Net Services Client-Side Configuration, Usage and Configuration of the Oracle Shared Server, Backup and Recovery Overview, Instance and Media Recovery Structures, Configuring the Database Archiving Mode, Oracle Recovery Manager Overview and Configuration, User Managed Backups, RMAN Backups, User Managed Complete & Incomplete Recovery, RMAN Complete Recovery, Incomplete Recovery & Maintenance, Recovery Catalog Creation and Maintenance, Transporting Data Between Databases

UNIT III Managing Oracle (9 L)

Oracle10i: Overview, Preparing the Operating System & Install Oracle9i Software, Create a Custom Oracle Database, Install and Configure Enterprise Manager, Customize the Oracle Database Linux Measurement Tools, Oracle Measurement Tools, Tuning Oracle

Database Troubleshooting

One Time Troubleshooting, Adhoc Troubleshooting, Escalations, Connectivity, Business Continuity, High Availability and Scalability, Data Sharing and information Integration

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LEARNING OUTCOMES

After the completion of course, students will have skill to

1. CO1. Explain the concepts of Oracle architecture components.
2. CO2. Explain the overview of Storage Structure and Relationships
3. CO3. Illustration of the concepts of Managing Process in Databases

Text Book:

1. Oracle Database Administrator's Guide, Wiley ,2014
2. Oracle DBA Handbook, McGraw Hill Education; 1st edition 2007

Reference Book:

1. Michael Wessler Oracle DBA on Unix and Linux, Prentice Hall; 1 edition, 2001

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	CS472	Subject Title	Information Security *(Departmental Elective 8/9)*					
LTP	2 0 2	Credit	3	Subject Category	DE	Year	4th	Semester	VIII

OBJECTIVES:

This course aims to give the students about the knowledge & various applications of information security in the area of computer science.

UNIT I **(8 L)**

Introduction: Security problem in computing, Secure system characteristics, what to secure –How to secure- at what cost?

Elementary Cryptography – DES – AES – Public Key Encryption – Uses of Encryption

Program Security: Security Programs – Non-malicious Program Errors – Virus and other Malicious Code – Targeted Malicious Code – Control against program Threats.

UNIT II **(9 L)**

Security in Operating Systems: Protected Objects and Methods of Protection – Memory and Address Protection –Control of Access generated Objects – File Protection Mechanisms – User Authentication – Trusted Operating Systems – Models of Security.

UNIT III **(9 L)**

Administering Security and Ethical Issues: Security Planning – Risk Analysis – Organizational Security Policies – Physical Security – Protecting Programs and Data – Information and the Law –Software Failures – Computer Crime – Privacy – Ethical Issues.

LEARNING OUTCOMES

At the end of the students shall able to learn about:

CO1. Identify and explain symmetric algorithms for encryption-based security of information.

CO2. Identify and explain public-key based asymmetric algorithms for encryption-based security of information.

CO3. Examine the issues related to administration security, physical security, and program security.

Text Book:

1. Charles B. Pfleeger, and Shari Lawrence Pfleeger, “Security in Computing”, Pearson Education, Third edition, 2003.

Reference Book:

1. Matt Bishop, “Computer Security – Art and Science”, Pearson Education, First edition, 2003.

2. William Stallings, “Cryptography and Network Security – Principles and Practices”, Prentice-Hall of India, Third edition, 2003.

3. Atul Kahate, “Cryptography and Network Security”, Tata McGraw-Hill, 2003.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	CS482	**Subject Title**	Human Computer Interaction						
LTP	3 0 0	**Credit**	3	**Subject Category**	DE/OE	**Year**	4th	**Semester**	VIII

Unit 1 **(8L)**

Introduction: Importance of user Interface–definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface –popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user –Interface popularity, characteristics- Principles of user interface.

Unit 2 **(7L)**

Design process–Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

Unit 3 **(8L)**

Screen Designing: Design goals–Screen planning and purpose, organizing screen elements, ordering of screen data and content –screen navigation and flow ,Visually pleasing composition -amount of information -focus and emphasis ,presentation of information simply and meaningfully information retrieval on web - statistical graphics –Technological consideration in interface design.

Unit 4 **(8L)**

Windows –New and Navigation schemes selection of window, selection of devices based and screen based controls.

Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

Unit 5 **(8L)**

Software tools –Specification methods, interface–Building Tools.

Interaction Devices – Keyboard and function keys –pointing devices –speech recognition digitization and generation – image and video displays – drivers.

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.

2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in Human Computer Interaction, Wiley, 2010.

REFERENCE:

1. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	IT357	Subject Title	Internet of Things						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	4th	Semester	VIII

Course Outline: To provide a detailed idea how the internet is connecting the entire world and helps to live a smart life with its technology.

Course Objective:

1. Vision and Introduction to IoT.
2. Understand IoT Market perspective.
3. Data and Knowledge Management and use of Devices in IoT Technology.
4. Understand State of the Art – IoT Architecture.
5. Real World Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Pre/Co- requisite (if any): Wireless Sensor Networks

Detailed Syllabus

UNIT 1: M2M to IoT(05 Lectures)

The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, use case example, Differing Characteristics.

UNIT 2: M2M to IoT (A Market Perspective)(10 Lectures)

Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.
IOT related open source software tools introduction; tools like IoTivity, IBM Blue Mix. Introduction to Contiki, Cooja, Raspberry Pi etc.

UNIT 3:M2M and IoT Technology Fundamentals(05 Lectures)

Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management.

UNIT 4: IoT Architecture-State of the Art(12 Lectures)

Introduction, State of the art, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model
IoT Reference Architecture: Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT 5:Industrial Automation(08 Lectures)

Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things

Commercial Building Automation: Introduction, Case study: phase one-commercial building automation today, Case study: phase two- commercial building automation in the future.

Learning Outcome

- Explain the definition and usage of the term 'The Internet of Things' in different contexts
- Understand where the IoT concept fits within the broader ICT industry and possible future trends
- Able to build and test a complete working IoT system Pursue lifelong learning for professional advancement.

Text book [TB]:

Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

Reference books [RB]:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	IT359	Subject Title	Mobile Computing and Services						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	4th	Semester	VIII

Course Objective:

1. Understand the fundamentals of wireless networks.
2. Understand and evaluate emerging wireless technologies and standards
3. To explore mobile security issues
4. To explore the mobility concept.

Detailed Syllabus

UNIT 1

Introduction: Mobile computing with functions & devices, Networks, Middleware & gateways, Application & services, Developing mobile computing applications, Security & standards why it necessary, Architecture for mobile computing. **(3 L)**

UNIT 2

Emerging Technologies: Bluetooth, Rfid, WiMAX, Mobile IP, IPv6, GSM architecture, Call routing in GSM, Mobile computing over SMS, Value added service through SMS, GPRS architecture & operations, 3G & applications **(10 L)**

UNIT 3

Wireless Transmission:
Signal propagation- path loss of radio signals, additional signal propagation effects, Multipath propagation,
Multiplexing- Space division, frequency division, time division, code division,
Modulation- ASK, FSK, PSK, AFSK, APSK, Multi-carrier modulation
Spread spectrum- Direct sequence & frequency hopping
Mac- Hidden & exposed terminals, near- far terminal, SDMA, TDMA, FDMA, Fixed TDM, CSMA, PRMA, Multiple access with collision avoidance **(12 L)**

UNIT 4

Wireless LAN: IEEE 802.11 in details, HIPERLAN, Link manager protocol, L2CAP, security, SDP. **(5 L)**

UNIT 5

Mobility & Security in mobile computing: HTTP,
Wireless application protocol- architecture, wireless datagram protocol, wireless transport layer security, wireless transaction & session protocol, WML, Push architecture, push/ pull services, i-mode & SyncML
Information security, Security techniques & algorithms, public key infrastructure, **(10 L)**

Learning Outcome

At the end of the course, Learning Outcomes Having successfully completed this course, the student will demonstrate:
1: Apply the fundamental design paradigms and technologies to mobile computing applications.

2: Develop consumer and enterprise mobile applications using representative mobile devices and platforms using modern development methodologies.
3: Appraise the quality and performance of mobile applications.
4: Assess and implement security principles in mobile applications.
5: Evaluate wireless network topologies, wireless connectivity and characteristics, and the impact of wireless networks on security and Internet communications.
6: Select appropriate wireless technologies in commercial and enterprise applications.

Text book [TB]:

- Jochen H. Schiller: Mobile Communications - Second Edition, Pearson
- Asoke K Talukder & Roopa R Yavagal: Mobile Computing Technology, Applications and Service Creation – Tata McGraw-Hill Publishing Company Limited

Reference books [RB]:

- William Stallings: Wireless Communications & Networks - Second Edition, Pearson
- Theodore S. Rappaport : Wireless Communications Principles & Practice - Second Edition, Pearson

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	EC386	Subject Title	Fundamental of Communication & Networks						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	4th	Semester	VIII

Objectives of the Course:

- To understand the concept of Computer Communication.
- To learn the basics of Data communication and Networks
- To develop and design the protocol systems for advance computer communication.

UNIT I: Introduction to Communication:

Communication system, Analog and Digital Communication, channel bandwidth. Ideal and Practical Filters, Concept of Signal Distortion over a Communication Channel, Energy Signal and Power Signal, Introduction to noise in Communication systems. **6L**

UNIT II: Introduction to Modulation techniques:

Concept of Amplitude Modulation, Concept of Frequency & Phase Modulation, Concept of ASK, FSK & PSK, Concepts of PCM. **8L**

UNIT III: Introduction to Data Communication Network & OSI Model:

Switching systems, network hardware and software, Layering, design issues for layering, reference models and their comparison, example of networks. Concepts of OSI model. **6L**

UNIT IV: Introduction to Data Communication Protocols and transmission media

MAC protocols- Aloha, CSMA, collision free protocols, Ethernet, IEEE 802.3 standard, IP protocols, IP addressing, OSPF, IPv4, IPv6. Transmission media and channel impairments, multiplexing, digital channels, switching. Repeaters, bridges, routers and gateways. **8L**

Text Books:

1. Forouzan, B.A., "Data Communication and Networking", 4th Ed., Tata McGraw-Hill.
2. Tanenbaum, A.S, "Computer Networks", 4th Ed., Pearson Education.
3. Stallings W., "Data and Computer Communication", 8th Ed., Prentice-Hall.
4. Simon Haykins, 'Communication Systems', John Wiley,5th edition

Reference Books:

1. Kurose, J.F. and Ross, K.W., "Computer Networking: A Top-Down Approach Featuring the Internet", 3rd Ed., Addison Wesley.

List of Experiments:

1. To generate amplitude modulated wave and determine the percentage modulation and Demodulate the modulated wave using envelope detector.
2. To generate AM-Double Side Band Suppressed Carrier (DSB-SC) signal.
3. To generate the SSB modulated and Demodulated wave.
4. To generate frequency modulated signal and determine the modulation index and bandwidth for various values of amplitude and frequency of modulating signal and to demodulate a FM signal
5. To study ASK modulation and Demodulation.
6. To study FSK modulation and Demodulation.
7. To study PSK modulation and Demodulation.
8. To Study TDM/PCM Transmitter /Receiver.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- Computer Communication and networks.
- Protocol design and their design issues.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	EC382	Subject Title	Biomedical Instrumentation						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	4th	Semester	VIII

Objectives of the Course: The students will learn

- Requirement of bio-medical and its application
- Concept of bio-potential electrodes and measurements related to them.
- Concepts of bio-transducers and measurements related to them.
- Concept of bio-medical instruments and their uses experimentally.

UNIT I: ANATOMY AND PHYSIOLOGY:

Basic Cell Functions, Origin of Bio-potentials, Electrical Activity of Cells, components of man Instrument system, types of bio-medical stems, design factors and limitations of biomedical instruments, terms and transducers to various physiological events. **8L**

UNIT II: BIO-POTENTIAL ELECTRODE:

Types of bio-potential electrodes., Electrode-Electrolyte interface, half cell potential, Polarization- polarisable and non-polarisable electrodes, Ag/AgCl electrodes, Electrode circuit model; Electrode and Skin interface and motion artifact. Body surface recording electrodes for ECG. Electrodes standards. **8L**

UNIT III: BIO-TRANSDUCER:

Transduction Principles: Resistive Transducers Strain Gauge- types, construction, selection materials, Gauge factor, Bridge circuit, Temperature compensation. Strain Gauge type Blood pressure transducers. Inductive Transducers, Capacitive Transducer, Piezoelectric Transducer. **8**

UNIT IV: BIOTELEMETRY AND ELECTRICAL SAFETY:

Bio-telemetry design, single channel bio telemetry transmitter and receiver system based on AM, FM and, pulse modulation. Significance of Electrical Danger, physiological effect of current, ground shock Hazards. **8L**

Text Books:

1. Joseph J. Carr & John. M. Brown, 'Introduction to Biomedical Equipment technology'
2. R.S. Khandpur, 'Handbook of Biomedical Instrumentation', McGraw Hill.

Reference Books:

1. J.G. Webster, 'Medical instrumentation application and design', Houghton Miffin Co., Boston USA.
2. Mohan Murali H, 'Monograph on Biomedical engineering', O.U. Press 1985.
3. Geddes L. A. & L. E. Baker, 'Principles of Applied Biomedical Instrumentation', Wiley, 1989.
4. Leslie Cromwell, Fred J. Weibell and Erich A. Pfeiffer, 'Biomedical Instrumentations and Measurements' (2nd edition), PHI, 1991.

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- Bio-medical instruments and measurements.
- Principle of working of bio-medical transducers.
- Skills to use modern bio-medical tools and equipment for measurements related to human body.

LIST OF EXPERIMENTS

2. Pulse measurement

3. Heartbeat measurement
4. Automatic BP measurement
5. Heart sound study using electronics stethoscope
6. ECG measurement

Following experiments to be done on the breadboard

7. Design of low noise and low frequency amplifier for biomedical application
8. Design of Instrumentation amplifier
9. Construction of chopper amplifier

Two Value Added Experiments to be added by Instructor.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	ME382	Subject Title	Ergonomics and Value Engineering						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VIII

Course Objective: This course provides an overview on principles of ergonomics and human factors, their applications to the design and management of industrial systems, Engineering anthropometry, Human performance, human-technology interaction, work place and work station design and concept of value engineering. To address the underlying concepts, methods and application of Value Engineering

Course Pre/Co- requisite (if any):
Detailed Syllabus

UNIT 1: Introduction of Ergonomics
Background of ergonomics, historical evolution of ergonomics, definition of ergonomics, aspect of ergonomics, man machine interaction, and man machine closed loop system, man machine system (MMS)
Work physiology
Muscle structure, metabolisms, circulatory and respiratory systems, energy expenditure and workload

UNIT 2: work related MSDs risk and work postures assessment
Introduction, assessment of work postures using RULA Methods, work posture assessment using rapid entire body assessment tool (REBA)
Office Ergonomics-
Introductions, Issues in workstation design, seat design, engineering anthropometry and work design, A case study: an investigation on passenger seat design in sleeper class coaches in Indian trains.

UNIT 3: Physical stress- Introduction, vibration, occupational noise exposure, sound, source of noise and vibration, basic theory of noise measurement, Noise measuring meters, basic sound level meters, noise control , permissible limits of exposure with respect to occupational noise.

UNIT 4: Value Engineering Introduction: Definition, value engineering recommendations, programs, advantages, Evaluation of function, determining function, classifying function, evaluation of costs, evaluation of worth, determining worth, and evaluation of value.
Value Engineering Job Plan: Introduction, orientation, information phase, Function phase, creation phase, evaluation phase, Investigation phase, implementation phase, speculation phase, analysis phase.

UNIT 5: Selection of Evaluation of Value Engineering Projects: Project selection, Methods selection, value standards, application of Value Engineering methodology.
Initiating Value Engineering Program: Introduction, training plan, career development for Value Engineering specialties.
Fast Diagramming: Cost models, life cycle costs.
Value Engineering level of Effort: Value Engineering team, Co-ordinator, designer, different services, definitions, construction management contracts, value engineering case studies

Learning Outcome

At the end of the course the student can:
CO1: Specify and design ergonomically appropriate industrial workstations for the industrial and office work environment.
CO2: Identify information-centered human factors relating to visual, illumination, controls, displays and symbols.

CO3: Compare, contrast and assess human body-centered ergonomic designs for posture, material handling, repetitive motion factors, heat stress, noise and vibration.
CO4: Define the ergonomic factors intrinsic in evaluating accidents, human errors and safety related incidents.
CO5: Student will understand the concepts, methods and application of Value Engineering

Text book [TB]:

1. Lakhwinder Pal Singh, "Work Study and Ergonomics:Cambridge University Press,2018.
2. Value Engineering : A Systematic Approach by Arthur E. Mudge - McGraw Hill 2010

Reference books [RB]:

1. The Power of Ergonomics as a Competitive Strategy By Gross & Right (Productivity Press) 2010.
2. MartandTelsang, Industrial Engineering and Production Management,S. Chand &Compagny Limited, 2006.
3. Value Engineering A how to Manual S.S.Iyer, New age International Publishers 2009.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	ME366	Subject Title	Product Design And Development						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	4th	Semester	VIII

Course Objective: This course aims at introducing the students to the basic concepts of engineering design and product development with focus on the front end processes. At the end of this course the student is expected to demonstrate an understanding of the overview of all the product development processes and knowledge of concept generation and selection tools.

Course Pre/Co- requisite (if any): Manufacturing Process, Industrial Engineering and Management

Detailed Syllabus

UNIT 1:

Significance of product design, Need for developing products, product design and development process, the importance of engineering design, sequential engineering design method, relevance of product lifecycle issues in design, the challenges of product development.

Product Planning and Project Selection: generic product development process, Identifying opportunities, evaluate and prioritize projects, allocation of resources, various phases of product development-planning for products.

UNIT 2:

Identifying Customer Needs voice of customer, customer populations, Interpret raw data in terms of customers need, hierarchy of human needs, need gathering methods, establish the relative importance of needs.

Product Specifications: Establish target specifications, setting final specifications

Concept Generation: Activities of concept generation, clarifying problem, search both internally and externally, explore the output

UNIT 3:

Industrial Design: Assessing need for industrial design, industrial design process, management, assessing quality of industrial design, human factors design, user friendly design

Concept Selection: Overview, concept screening and concept scoring, methods of selection, case studies.

UNIT 4:

Theory of inventive problem solving (TRIZ): Fundamentals, methods and techniques, General Theory of Innovation and TRIZ, Value engineering Applications in Product development and design, Model based technology for generating innovative ideas measurement of customers response.

Concept Testing: Elements of testing: qualitative and quantitative methods including survey.

UNIT 5:

Intellectual Property: Elements and outline, patenting procedures, claim procedure.

Design for Environment: Impact, regulations from government, ISO system, case studies.

Learning Outcome

At the end of the course the student can:

CO1:Product Design and Innovation course is intended to introduce overall awareness of the product design process.

CO2:This course will give an understanding of methods, tools and techniques applied in product design.

CO3:This course includes overview of innovation, product design process, user study, need/problem identification, development of design brief, understanding competitive benchmarking, aspects of human factors in product design, tools for creative concept generation, and prototyping/model making and evaluation techniques for user-product interaction.

CO4:This course will be explained with lectures including case studies and hands-on exercises. This will help students to generate creative ideas in to product design, considering human factors aspects.

Text book [TB]:

1. Anita Goyal, Karl T Ulrich, Steven D Eppinger, “Product Design and Development”, Tata McGraw-Hill Education, 4th Edition, 2009.
2. Kevin Otto, Kristin Wood, “Product Design”, Pearson Education, Indian Reprint 2004.

REFERENCES [RB]:

1. Yousef Haik, T. M. M. Shahin, “Engineering Design Process Cengage Learning, 2010”, 2nd Edition Reprint.
2. Kevin Otto, Kristin Wood, “Product Design”, Pearson Education Indian Reprint 2004.
3. Clive L.Dym, Patrick Little, “Engineering Design: A Project-based Introduction”, John Wiley & Sons, 3rd Edition 2009.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	ME452	Subject Title	Renewable Energy Sources						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VIII

Course Objective: To provide students an overview of global energy resources with focus on renewable energy sources and their importance in the context of limited supply of conventional energy resources & global warming.

Course Pre/Co- requisite (if any): Basic Thermodynamics, Heat Transfer

Detailed Syllabus

UNIT 1: ENERGY RESOURCES

Introduction: Energy & its importance in social & economic development; energy demand & supply, world energy status, energy scenario in India; energy & environment, greenhouse effect & global warming; role of renewable energy sources; a brief introduction to various renewable energy sources – hydro, solar, biomass, wind, geothermal & ocean energy – their availability & present status.

UNIT 2: SOLAR ENERGY

The sun as a source of energy, extraterrestrial & terrestrial solar radiation; solar radiation data & geometry, solar radiation on horizontal & inclined surfaces; solar thermal systems – various types of solar collectors & their applications in cooking, drying, water heating, distillation, space heating & cooling, refrigeration and power generation.

Solar photovoltaic systems, solar cell fundamentals, performance & characteristics, types of solar cells; solar cell, module, and array construction; solar PV applications.

UNIT 3: BIOMASS ENERGY

Origin of biomass, photosynthesis & generation of biomass, availability of biomass, usable forms of biomass – fuel wood, charcoal, fuel pellets, biodiesel, bioethanol, biogas and producer gas; biomass conversion technologies, thermochemical & biochemical methods, biomass gasification, classification & operational parameters of biogas plants, energy recovery from urban waste, sewage to energy conversion.

UNIT 4: WIND ENERGY

Origin & nature of winds; history of power from winds; global & local winds; estimation of wind energy at a site; maximum power extraction from wind – Betz criterion; capacity factor of wind power plants; types of wind turbines – horizontal and vertical axis wind turbines; wind energy storage; environmental & economic aspects; present status of wind energy systems.

UNIT 5: GEOTHERMAL & OCEAN ENERGY

Structure of earth's interior; origin & distribution of geothermal energy, types of geothermal resources – exploration & development of hydrothermal, geo-pressured & hot dry rock resources; electrical power generation from geothermal energy; environmental & economic considerations.

Ocean energy; tidal, wave & ocean thermal energy, energy from tidal streams (marine currents); technology for harnessing tidal & wave energy; ocean thermal energy conversion technology.

Learning Outcome

At the end of the course the student will:

CO1: Understand about the interaction between energy, economy, environment, and social development.

CO2: Appreciate the importance of renewable energy sources & future energy systems based on them.

CO3: Possess the basic technical knowledge to develop energy systems based on solar, biomass, wind, geothermal & ocean energy.

Text book [TB]:

1. B. H. Khan, "Non-Conventional Energy Resources", 3rd edition (2017), McGraw Hill Education (India) Private Limited, Chennai.
2. S. P. Sukhatme& J. K. Nayak,"Solar Energy", 4th edition (2018), McGraw Hill Education (India) Private Limited, Chennai.

References [RB]:

1. G. N. Tiwari & M. K. Ghosal, "Renewable Energy Resources – Basic Principles and Applications", 2005, Narosa Publishing House, New Delhi.
2. D.P. KOTHARI, K. C. SINGAL, RAKESH RANJAN, Renewable Energy Sources And Emerging Technologies, PHI Learning Pvt. Ltd., 25-Nov-2011.

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	CE483	Subject Title	GIS					
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VIII

Course Objective: The course provides wide knowledge about basics of GIS and its applications in various fields

Unit-1: Introduction

8L

Definition of GIS, Cartography and GIS, GIS database: spatial and attribute date; Spatial models: Semantics, spatial information, temporal information, conceptual models of spatial information, representation of geographic information: point, line and area futures, topology,

Unit-2: Components

12L

Raster and vector data, raster to vector data conversion, map projection, analytical transformation, rubber sheet transformation, manual digitizing and semi-automatic line following digitizer; Remote sensing data as an input to GIS data;

Unit-3: Classifications and Functions

10L

Attribute database: scale and source of inaccuracy; GIS functionality; data storage and data retrieval through query, generalization, classification, containment search within a spatial region;

Unit-4: Analysis

5L

Overlay: arithmetical, logical and conditional overlay, buffers, inter visibility, aggregation; Network analysis;

Unit-5: Applications

4L

Applications of GIS in planning and management of utility lines and in the filed of environmental engineering, geotechnical engineering, transportation engineering and water resources engineering.

Course Outcome: The students will learn from this course:

- Basic understanding of GIS concepts, components.
- Analyzing geo-spatial data with various techniques and GIS tools
- Apply the concepts in solving environmental and engineering problems
- Create new information and theoretical knowledge after applying GIS tools

Books Recommended:

1. Geographic Information Systems: A Management Perspective, by Stan Arnoff, WDL Publications.
2. Fundamentals of Spatial Information Systems by Robert laurini and Derek Thompson, Academic Press.
3. Geographical Information Systems, Vol. I and II edited by Paul Longely, M.F. Good child, et.al, John Wiley and Sons, Inc. 1999

Course Structure & Syllabus of B.Tech – Electrical Engineering
Applicable for Batch: 2017-2021

Subject Code	PE491	Subject Title	Carbon Capture and Sequestration Technology						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VIII

1. Course Summary

The course provides information about the students to learn the basic concept and Applications of Carbon capture and storage process. In this course, students will learn about carbon capture techniques and the concept of the contribution of fossil fuel to climate change. During this course students will examine the Co2 emission and Carbon dioxide recycling.

2. Course Objectives

The students should be able to:

1. The objective of this course is make students familiar with the principles and applications of carbon capture and storage capture techniques and role of CCS.

3. Course Outcomes

1. To acquaint the students substantially to the objectives and necessity of Carbon Sequestration and capture.
2. To introduce the contribution of fossil fuel to climate change.
3. To understand the concept of emission and recycling of CO2.
4. To introduce the candidates to the concept of underground storage and other Carbon Capture and sequestration concepts.
5. To understand the implementation of CCS technology and IPCC.

4. Curriculum Content

UNIT 1

Introduction: Scope, Objectives and Necessity of CCS.

UNIT 2

The contribution of fossil fuels emission to Climate change and global warming. Concept of Carbon Credit and carbon footprint.

UNIT 3

Carbon capture techniques: Carbon-di-oxide emission, Scrubbing of CO2, Carbon dioxide recycling.

UNIT 4

Carbon dioxide sequestration: Underground storage, Potential for Geologic Storage, Application in Oil and gas industry, Carbon di oxide flooding projects, Methane recovery projects.

UNIT 5

Strategy for implementing CCS technology: Modelling of Cost and Performance of CCS Plants. Role and function of IPCC.

Text book [TB]:

1. Carbon Capture; Jennifer Wilcox; Springer
2. Capturing Carbon – The new weapon in the War Against Climate Change; Mills, Robin M.; Columbia University Press

Reference books [RB]:

1. Piping and pipeline engineering, George A. Antaki, Marcel Dekker Inc. New York.
2. Fundamentals of pipeline engineering by J. Vincent Genod, Technip Editions

5. Teaching and Learning Strategy

All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Subject Code	MA452	Subject Title	Optimization Techniques						
LTP	3 0 0	Credit	3	Subject Category	Open Elective	Year	4th	Semester	VIII

Unit 1:Introduction to optimization, Statement and classification of optimization problem, Multi-objective optimization, Multi-variable optimization problem with equality and inequality constraints, Classical optimization techniques, Single variable and multivariable optimization problems,Operation Research approach, general methods for Operation Research models, methodology and advantages of Operation Research.

Unit 2: Introduction to LPP and formulation of Linear Programming problems, Graphical solution method, alternative or multiple optimal solutions, Unbounded solutions, Infeasible solutions, Maximization – Simplex Algorithm, Minimization – Simplex Algorithm using Big-M method, Two phase method, Duality in linear programming.

Unit 3: Introduction to Transportation problems, various methods of Transportation problem, Variations in Transportation problem, introduction to Assignment problems, variations in Assignment problems. Sequential optimization, Representation of multistage decision process; Types of multi stage decision problems; Concept of sub optimization and the principle of optimality.

Unit 4:Optimization techniques,Memetic algorithm, Differential evolution, Evolutionary algorithms,Dynamic relaxation,Genetic algorithms, Hill climbing with random restart, Genetic Algorithm (GA), Artificial Bee Colony (ABC), Particle Swarm Optimization (PSO),Firefly algorithm, Fish School Search, Fly algorithm, Ant colony optimization algorithms

References:

1. S.S. Rao, "Engineering Optimization: Theoryand Practice", New Age International P)Ltd.,New Delhi, 2000.
2. G. Hadley, "Linear programming", NarosaPublishing House, New Delhi, 1990.3.
3. H.A. Taha, "Operations Research: AnIntroduction", 5th Edition, Macmillan, New York, 1992.4.
4. K. Deb, "Optimization for Engineering Design-Algorithms and Examples", Prentice-Hall ofIndia Pvt. Ltd., New Delhi, 1995.
5. S.D. Sharma, “Operations Research”, Kedar Nath Ram Nath Publishers, 2009.

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Code	AR-485	Subject Title	ART APPRECIATION						
LTP	3 0 0	Credit	3	Subject Category	OE	Year	4th	Semester	VIII

Course Objective:

To create an overview and understanding of various art forms that exists from ancient to modern times.

Unit 1: INTRODUCTION

Understanding various art forms in society and in different cultures.

Unit 2: Sociological Perspective

Relationship between art, culture and society. Influence of art forms on people.

Unit 3: Appreciation-I: Painting/ Sculptures

Understanding and appreciating films/ documentaries from past to present timesand between east and west

Unit 4: Appreciation-II: Films/ Documentries

Understanding and appreciating painting and sculptures from past to present times and between east and west

Unit 5: Appreciation-III: Indigenous/ Folk Art

Understanding and appreciating Indigenous/ Folk art from past to present times and between east and west.

LEARNING OUTCOME:

4. The student will be able to understand the various art forms.
5. The students will be able to understand and establish a relationship between art, culture and society.
6. The students will be able to appreciate the various art.

Text Books:

3. Creative Authenticity: 16 Principles to Clarify and Deepen Your Artistic Vision, Ian Roberts

Reference Books:

The Writer: A Concise Complete and Practical Text Book of Rhetoric. Designed to Aid in The Appreciation, George Lansing Raymond

Course Structure & Syllabus of B.Tech – Electrical Engineering

Applicable for Batch: 2017-2021

Code	PY481	Subject Title	Nano scale science and technology						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VIII

Unit 1 **(10L)**

Introduction to nanotechnology, definition, history of nanotechnology, nanotechnology in relation to other branches of engineering, characteristic length scale of materials and their properties, classification of nano materials, dimensionality and size dependent phenomena, confinement in 0-D, 1-D, 2-D and 3-D,surface to volume ratio, fraction of surface atoms, surface energy.

Unit 2 **(7L)**

Nanomaterials synthesis techniques; top-down and bottom-up techniques, ball milling, PVD, CVD, self-assembly.

Unit 3 **(8L)**

Nanomaterials characterization; XRD, SEM, TEM, AFM, UV-VIS.

Unit 4 **(8L)**

Nanomaterials and their properties: carbon based nano materials, metal based nano materials, quantum dots, biological nano materials.

Unit 5 **(7L)**

Applications of nanotechnology in engineering, solar energy conversion, nanomedicine.

Text Books:

1. Poole, Jr. CP and Owens, FJ, "Introduction to Nanotechnology", Wiley India. 2006.
2. Cao, G., Nanostructures and Nanomaterials: Synthesis, Properties and Applications, Emperial College Press (2004).
3. Edward L. Wolf: Nanophysics and Nanotechnology: An Introduction to Modern Concepts in Nanoscience, 2nd ed., Wiley-VCH, 2006.