Course Structure& Syllabus of B.Tech in Electronics & Communication Engineering
Applicable for Batch: 2018-22

DIT UNIVERSITY
Dehradun

Detailed Course Structure & Syllabus of B.Tech – Electronics & Communication Engineering

Amended by the BoS and approved by the Academic Council at its 9th Meeting held on 14.04.2018

Course Structure& Syllabus of B.Tech in Electronics & Communication Engineering
Applicable for Batch: 2018-22

Year: 1st **Semester: I**

Course Category	Course Code	Course Title	L	T	P	Credit
UC	HS 103	Professional Communication	2	0	2	3
UC	MA 101	Engineering Mathematics-I	3	1	0	4
UC	EE 103	Basic Electrical Engineering	3	1	2	5
UC	PY102 / PY 103 / PY104	Introduction to Mechanics / Waves and Optics and Introduction to Quantum Mechanics / Introduction to Electromagnetic Theory	3	1	2	5
UC	ME 103	Engineering Graphics	0	0	3	1.5
		Total				**18.5**

Year: 1st **Semester: II**

Course Category	Course Code	Course Title	L	T	P	Credit
UC	MA 102	Engineering Mathematics - II	3	1	0	4
UC	CH 101	Engineering Chemistry	3	1	2	5
UC	ME 105	Engineering Mechanics	2	1	2	4
UC	ME 104	Workshop Practice	0	0	2	1
UC	CS 105	Programming for Problem Solving	3	0	4	5
		Total				**19**

Course Structure& Syllabus of B.Tech in Electronics & Communication Engineering
Applicable for Batch: 2018-22

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	MA202	Probability and Statistics	3	1	0	4
DC	EC201	Electronic Devices and Circuits	3	1	2	5
	EC202	Digital System Design	3	0	2	4
	EC203	Signals and Systems	3	0	0	3
	EC204	Electromagnetic Field Theory	3	1	0	4
	EE209	Circuit Analysis and Synthesis	3	1	2	5
AC	HS201	Aptitude & Soft Skills- 1	2	0	0	0
Total						**25**

Year: 2nd **Semester: IV**

Course Category	Course Code	Course Title	L	T	P	Credit
AC	CH201/HS244	Environmental Science/Indian Constitution	2	0	0	0
HE		Humanities Elective-1	2	0	0	2
DC	EC205	Digital Signal Processing	3	1	2	5
	EC206	Discrete Analog Circuits	3	0	2	4
	EC207	Principles of Antenna & Wave Propagation	3	0	2	4
	EC208	Computer Organizations & Microprocessors	3	0	0	3
	EC209	IC Applications	3	0	2	4
AC	EC230	Value Added Training	0	0	2	0
AC	HS204	Aptitude & Soft Skills- 2	2	0	0	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 in Electronics & Communication Engineering
Applicable for Batch: 2018-22

Year: 3rd **Semester: V**

Course Category	Course Code	Course Title	L	T	P	Credit
DC	EC301	Principle of Communication Engineering	3	1	2	5
	EE301	Control System	3	0	2	4
DC	CS201	Data Structures	3	0	2	4
HE		Humanities Elective-2	2	0	0	2
PRJT	EC303	Study Project	0	0	4	2
ST	EC304	Summer Training Evaluation	0	0	0	0
DE		Department Elective-1				4
AC	HS301	Aptitude & Soft Skills- 3	3	0	0	0
Total						**21**

Department Elective 1

Course Code	Course Title	L	T	P
EC341	Transducers and Instrumentation	3	0	2
EC342	Digital Design using Verilog	3	0	2
EC343	Microwave and Radar	3	0	2
EC344	Filter Design	3	0	2
EC345	VLSI Design	3	0	2
CS343	Advanced Concepts in OOPs	3	0	2
CS344	Introduction to Cloud Technologies	3	0	2
CS202	Java Programming Concepts	3	0	2
CS204	Database Management System	3	0	2
EE342	Telemetry & Data Transmission	3	0	2
EE343	Dynamic System Analysis	3	1	0
EE344	Utilization of Electrical Energy & Traction	3	1	0
EE346	Wind and Solar Energy Systems	3	0	2
EE347	High Voltage Engineering	3	1	0
CS211	Discrete Mathematics	3	1	0

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 in Electronics & Communication Engineering
Applicable for Batch: 2018-22

Year: 3rd **Semester: VI**

Course Category	Course Code	Course Title	L	T	P	Credit
DC	EC305	Digital Communication	3	0	3	4.5
DC	EC306	Microprocessor-8086	3	0	2	4
PRJT	EC307	LAB/Design Project – I	0	0	10	5
OE		Open Elective-1	3	0	0	3
	EC308	Industrial Tour*	0	0	2	0
DE		Department Elective-2	3	0	0	3
		Department Elective-3				4
		Department Elective-4				4
AC	HS304	Aptitude & Soft Skills-4	3	0	0	0
Total						**27.5**

Department Elective 2

Course Code	Course Title	L	T	P
EC354	Fundamentals of analog CMOS IC design	3	0	0
EC356	VLSI Fabrication Technology	3	0	0
IT359	Mobile Computing and Services	3	0	0
CS301	Algorithms: Analysis & Design	3	0	0

Department Elective 3

Course Code	Course Title	L	T	P
EC351	Data Communication Network	3	1	0
CS214	Operating Systems	3	1	0
EE349	Non-Conventional Energy Resources	3	1	0
CS303	Computer Graphics	3	0	2
CS348	Advanced Computer Network	3	0	2
EC352	Biomedical Instrumentation	3	0	2
EE348	Electrical Machine Design	3	0	2

Department Elective 4

Course Code	Course Title	L	T	P
EE350	Special Electrical Machine	3	1	0
EC353	Microcontroller	3	0	2
EC355	Advanced Antennas	3	0	2
IT345	R Programming	3	0	2
IT346	Advanced Web Technology	3	0	2
CS361	Pattern Recognition in AI	3	0	2
CS346	Introduction to Big Data Analytics	3	0	2
CS205	Dot Net Technologies	3	0	2

Open Elective 1

Course Code	Course Title	L	T	P
CS351	Software Engineering	3	0	0

Course Structure& Syllabus of B.Tech in Electronics & Communication Engineering
Applicable for Batch: 2017-2021

Year: 4th **Semester: VII**

Course Category	Course Code	Course Title	L	T	P	Credit
DC	EC401	Wireless Communication	3	1	0	4
OE		Open Elective-2	3	0	0	3
PRJT	EC402	LAB/Design Project - II	0	0	16	8
DE		Department Elective-5				3
		Department Elective-6				3
		Department Elective-7				4
UC	ME381	Entrepreneurship & Start Up	2	0	2	3
AC	HS311	Employment Enhancement Program	2	0	0	0
Total						**28**

Department Elective 5

Course Code	Course Title	L	T	P
EC461	Solid State Microwave Devices	3	0	0
EC462	Digital Image Processing	2	0	2
EC466	Design of Communication System	3	0	0
CS452	Information storage and Management	3	0	0
CS453	Parallel Computing	3	0	0

Department Elective 6

Course Code	Course Title	L	T	P
EC463	Optical Fiber Communication	2	0	2
EC464	Emerging Trends In Instrumentation System	3	0	0
EC465	Neural and Fuzzy system	2	0	2
EC467	Optimization Theory	3	0	0
CS454	Introduction to Genetic Algorithms and Fuzzy Logic	3	0	0
EC469	Real Time Operating System	3	0	0

Department Elective 7

Course Code	Course Title	L	T	P
CS342	Linux Administration & Shell Programming	3	0	2
CS302	Artificial Intelligence	3	0	2
CS442	Cryptography and Network Security	3	0	2
EE441	Power Quality	3	1	0
EE443	Electric Drives	3	0	2
EE403	MATLAB for Engineers	3	0	2

Course Structure& Syllabus of B.Tech in Electronics & Communication Engineering
Applicable for Batch: 2017-2021

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
EE481	New and Renewable Energy Sources	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

Year: 4th **Semester: VIII**

Course Category	Course Code	Course Title	L	T	P	Credit
IP/THESIS	EC405	Industrial Project/Thesis	0	0	32	16
		or				
HE		Humanities Elective-3	2	0	0	2
OE		Open Elective-3	3	0	0	3
DE		Department Elective-8	2	0	2	3
		Department Elective-9	2	0	2	3
		Department Elective-10	3	0	0	3
		Department Elective-11	3	0	0	3
Total						**17**

Department Elective 8

Course Code	Course Title	L	T	P
CS457	Soft Computing	2	0	2
CS443	LAMP Technology	2	0	2
CS471	Data Base Administration	2	0	2
IT461	Distributed System	2	0	2

Department Elective 9

Course Code	Course Title	L	T	P
CS472	Information Security	2	0	2
CS473	Computer Vision	2	0	2
CS474	Object oriented modelling & Design	2	0	2
IT453	Introduction to Remote sensing and GIS	2	0	2

Department Elective 10

Course Code	Course Title	L	T	P
EC471	Nanotechnology	3	0	0
EC474	Satellite Communication	3	0	0

Amended by the BoS and approved by the Academic Council at its 9th Meeting held on 14.04.2018

EC477	Optical Network	3	0	0
EC478	PLC, DCS and SCADA	3	0	0

Department Elective 11

Course Code	Course Title	L	T	P
EC472	Photonics	3	0	0
EC473	Automotive Electronics	3	0	0
EC475	Spread Spectrum System	3	0	0
EC479	Latest Trends in Communication	3	0	0

Humanities Elective 3

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

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
EE485	Basic Instrumentation & Process Control	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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Summary of the Credits

Year	Semester	Credit
1	1	19
	2	18.5
2	3	25
	4	22
3	5	21
	6	27.5
4	7	28
	8	16 / 17
Total		177 / 178

Category wise classification of the Credits

Category	Credits	No. of Subjects
AC	0	9
DC	66.5	16
DE	37	11
HE	6	3
IP/THESIS	16	1
OE	9	3
PRJT	15	3
SC	4	1
ST	0	1
UC	40.5	11
Total	177 / 178	59

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	HS103	Subject Title	Professional Communication						
LTP	2-0-2	Credit	3	Subject Category	UC	Year	1st	Semester	I / II

Course Outline:

Course Objective:

To develop the LSRW skills of students for effective communication, to equip the students for business environment, to prepare the students understand and present themselves effectively

Course Pre/Co- requisite (if any):

UNIT 1: Communication

Communication: Meaning, Types of Communication: General and Technical Communication. Knowledge and adoption of Non Verbal cues of communication: Kinesics, Proxemics, Chronemics, Oculesics, Haptics, Paralinguistics. Barriers to Communication, Overcoming strategies.

UNIT 2: Listening & Speaking Skills

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

UNIT 3: Reading Skills & Technical Writing Skills

Reading Strategies and Vocabulary Building Reading Comprehension. Paragraph development. Intra office Correspondence: Notice, Agenda, Minutes and Memorandum. Technical Proposal & Report.

UNIT 4: Business Letter Writing

Business Letter Writing, Job Application Letter & Resume, Interview Skills, Impression Management, Swot Analysis (Identifying Strength & Weakness), EQ and Its Dimensions

Learning Outcome

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

CO1. Communicate smoothly

CO2. Write formal documents

CO3. Present themselves effectively

Text book [TB]:

1. Rizvi, Ashraf. Effective Technical Communication, McGraw Hill, New Delhi. 2005.
2. Raman, Meenakshi and Sangeeta Sharma,. Technical Communication: Principles and Practice, 2nd Edition. New Delhi: Oxford University Press. 2011.

Reference Books [RB]:

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.
1. Kameswari, Y. Successful Career Soft Skills and Business English, BS Publications, Hyderabad.2010.
2. Tyagi, Kavita & Padma Misra. Basic Technical Communication, PHI, New Delhi. 2011.

List of Experiments:

1. Neutralization of Mother Tongue Influence through manner of articulation, Introduction to Speech Sounds – Practicing Vowel and Consonant sounds
2. Listening (Biographies through software) & Presentation of Biographies
3. Listening & Role Play on Situational/ Telephonic Conversation (through software)
4. Picture presentation
5. Public Speaking
6. Group Discussion
7. Case Studies
8. SWOT analysis
9. Interview
10. Final evaluation

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	MA101	Subject Title	Engineering Mathematics-I						
LTP	3-1-0	Credit	4	Subject Category	UC	Year	1st	Semester	I / II

Course Outline:

Course Objective:

To introduce the fundamentals in Differential, Integral and Vector Calculus, use of tools for solving engineering problems.

Course Pre/Co- requisite (if any):

UNIT 1: Limit, Continuity and Differentiability

Review of Limit, Continuity and Differentiability; Indeterminate forms, L' Hospital's rule, Rolle's Theorem, Mean Value theorem and its applications, Successive Differentiation, Leibnitz's Theorem, Taylor's and Maclaurin's Series, Maxima and Minima, Asymptotes, Curvature, Evolutes, Involutes, Sketching of curves.

UNIT 2: Multivariable calculus (Differentiation)

Limit, Continuity, Partial Derivatives, Euler's Theorem, Total Derivatives, Taylor's series, Maxima and Minima, Method of Lagrange's multipliers.

UNIT 3: Multiple Integral

Review of indefinite and definite integrals and its application to evaluate surface area and volume of revolutions, Beta and Gamma functions and their properties, Double integral, Change of order of integration, Change of variables, triple integral, Dirichlet's integral and their applications.

UNIT 4: Vector Calculus

Scalar and Vector functions, fields, Gradient and its applications, Directional derivative, Divergence and Curl and their applications. Line integral, Surface integral, Statement of Green's Theorem, Volume integral, Statements of Stokes and Divergence Theorems and their applications.

Learning Outcome

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

CO1. Learn techniques in calculus, multivariate analysis and linear algebra.

CO2. Equip the students with standard concepts and tools for tackling advanced level of mathematics and applications.

CO3. Familiarity with fundamental tools of Differential, Integral and Vector Calculus.

Text book [TB]:

1. G. B. Thomas Jr. and R. L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson Education, 2017.
2. R. K. Jain and S. R. K. Iyenger, Advanced Engineering Mathematics, 2nd Edition, Narosa Publishing House, New Delhi, India, 2014.

Reference Books [RB]:

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EE103	Subject Title	Basic Electrical Engineering						
LTP	3-1-2	Credit	5	Subject Category	UC	Year	1st	Semester	I / II

Course Outline:

Course Objective:

- To apprise students about electric charge, current, voltage and various circuit laws involved in analysis.
- To get acquainted with the basic idea of Generation, Transmission and Distribution of Electrical energy.
- To provide the basic knowledge of operation and working of different types of electrical equipment and their applications.

Course Pre/Co- requisite (if any):

UNIT 1: D.C. Network Theory

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, Magnetic Circuits.

UNIT 2: A.C. Circuits & Measuring Instruments

Single Phase A.C.: Phasor representation of voltage and current, A.C. circuit behavior of resistance, inductance, capacitance & their combination in series and parallel, Power triangle, Power factor, Concept of series & parallel resonance.

Three Phase A.C.: Star – delta connections, Relation between line and phase quantities, three phase power and its measurement, What is 3 phase 4 wire and 3 phase 3 wire system.

Measuring Instruments: Construction and principle of voltage and current measuring instruments.

UNIT 3: Power System & Transformers

Single line diagram of simple power system.

Single phase Transformer: Principle of operation, Types of construction, Phasor diagram, Equivalent circuit, Efficiency and voltage regulation, O.C. and S.C. tests.

UNIT 4: D.C. & Synchronous Machines

D.C. Machines: Construction and working principle of d.c. generator and d.c. motor, Types of d.c. machines, E.M.F. equation, Torque equation, characteristics, Losses and efficiency, Need of starter in d.c. motors.

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

UNIT 5: Induction Motors

Three Phase Induction Motors: Principle of operation of 3-Ø induction motor, Types of 3-Ø induction motor, Need of starters in 3-Ø induction motors, Slip – torque characteristics

Single Phase Induction Motor: Principle of operation of single phase induction motor by double revolving field theory, Methods of starting of single phase induction motor.

Learning Outcome

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

CO1. Students will be familiar about electrical charge, current, voltage and various basic electric circuit laws.

CO2. Acquaint students about DC circuit analysis and methods

CO3. Advanced approach for solving series parallel network of resistors by star delta transformation.

CO4. Acknowledge students with the use of transformers and its working.

CO5. To build an ability amongst students regarding the functioning of DC machines and its characteristics.

CO6. Students will recognize the need for synchronous machine in our electrical systems, its basic functioning and various advantages over other types of machines.

Text book [TB]:

1. V. Del Toro. “Principles of electrical Engineering”, Prentice hall International.
2. J. Nagrath, “Basic Electrical Engineering”, Tata Mc Graw Hill.

Reference Books [RB]:

1. W.H. Hayt & J.E. Kemmerly, “Engineering circuit Analysis”, Mc Graw Hill.
2. H. Cotton, “Advanced Electrical Technology” Wheeler Publishing.

List of Experiments:

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	PY102	Subject Title	Introduction to Mechanics						
LTP	3-1-2	Credit	5	Subject Category	UC	Year	1st	Semester	I / II

COURSE OBJECTIVE: To teach students the effects of electric charges at rest and in motion. Both positive and negative charges produce force field which is called "electric field". Moving charges produce current, which gives rise to another force field called "magnetic field". The electromagnetic theory studies the behavior of the electric and magnetic fields.

Unit 1: Electrostatics in vacuum (8L)

Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction; Practical examples like Faraday's cage and coffee-ring effect; Boundary conditions of electric field and electrostatic potential; method of images; energy of a charge distribution and its expression in terms of electric field.

Unit 2: Electrostatics in a linear dielectric medium (5L)

Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement; solving simple electrostatics problems in presence of dielectrics – Point charge at the centre of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field.

Unit 3: Magnetostatics (6L)

Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities

Unit-4: Magnetostatics in a linear magnetic medium (4L)

Magnetization and associated bound currents; auxiliary magnetic field $\vec{H}$; Boundary conditions on $\vec{B}$ and $\vec{H}$. Solving for magnetic field due to simple magnets like a bar magnet; magnetic susceptibility and ferromagnetic, paramagnetic and diamagnetic materials; Qualitative discussion of magnetic field in presence of magnetic materials.

Unit- 5: Faraday's law (4L)

Faraday's law in terms of EMF produced by changing magnetic flux; equivalence of Faraday's law and motional EMF; Lenz's law; Electromagnetic breaking and its applications; Differential form of Faraday's law expressing curl of electric field in terms of time-derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi-static approximation; energy stored in a magnetic field.

Unit- 6: Displacement current, Magnetic field due to time-dependent electric field and Maxwell's equations (4L)

Continuity equation for current densities; Modifying equation for the curl of magnetic field to satisfy continuity equation; displace current and magnetic field arising from time-dependent electric field; calculating magnetic field due to changing electric fields in quasi-static approximation. Maxwell's equation in vacuum and non-conducting medium; Energy in an electromagnetic field; Flow of energy and Poynting vector with examples. Qualitative discussion of momentum in electromagnetic fields.

Unit- 7: Electromagnetic waves **(8L)**

The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples. Momentum carried by electromagnetic waves and resultant pressure. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

COURSE OUTCOME:

At the end of the course, the student can :

CO1. To know Newton's laws of motion, potentials, conservation of energy, momentum and angular momentum, and be able to apply them to projectiles, circular motion, and gravity

CO2. Demonstrate an understanding of intermediate mechanics topics such as co-ordinate transformations, oscillatory motion, gravitation etc.

CO3. Demonstrate rigid body and rotational dynamics using the concept of angular velocity and momentum.

CO4. Understand the concept of non-inertial frames of reference, coriolis and centripetal accelerations and their applications.

TEXT BOOKS

David Griffiths, Introduction to Electrodynamics, PHI Learning, 2012.

REFERENCE BOOKS

1. Halliday and Resnick, Physics, Wiley, 2013.
2. W. Saslow, Electricity, Magnetism and Light, Academic Press, 2002.

SR.NO.	LIST OF EXPERIMENTS (ANY TEN)
1	Identification of various electronic components.
2	Use of multimeter for testing diodes, LEDs, transistors and measurements of resistance, capacitance, inductance, dc voltage, dc current, ac voltage, ac current and frequency of ac mains.
3	Charging and discharging of capacitor through resistance and determination of time constant.
4	To determine the specific resistance of a given wire using Carey Foster's bridge.
5	To verify Stefan's law by electrical method.
6	To study the variation of magnetic field with distance along the axis of a current carrying coil and determination of radius of the coil.
7	To calibrate the given voltmeter using potentiometer.
8	To calibrate the given ammeter using potentiometer.
9	To determine the band gap of a semiconductor p-n junction.
10	To determine the resistance of a sample using four probe method.
11	To determine the band gap of semiconductor using four probe method.
12	To determine a unknown resistance using Wheatstone bridge.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	PY103	Subject Title	Waves and Optics and Introduction to Quantum Mechanics						
LTP	3-1-2	Credit	5	Subject Category	UC	Year	1st	Semester	I / II

COURSE OBJECTIVE: The objective of this course is to develop a fundamental basis of waves, optical phenomenon, concepts of quantum mechanics and semiconductor physics which the engineering students can apply to their respective area of specialization.

Unit 1: Waves **(4L)**

Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator, forced mechanical and electrical oscillators, impedance, steady state motion of forced damped harmonic oscillator

Unit 2: Non-dispersive transverse and longitudinal waves **(4L)**

Transverse wave on a string, the wave equation on a string, Harmonic waves, reflection and transmission of waves at a boundary, impedance matching, standing waves and their Eigen frequencies, longitudinal waves and the wave equation for them, acoustics waves

Unit 3: Light and Optics **(4L)**

Light as an electromagnetic wave and Fresnel equations, reflectance and transmittance, Brewster's angle, total internal reflection, and evanescent wave. Mirrors and lenses and optical instruments based on them.

Unit-4: Wave Optics **(4L)**

Huygens' principle, superposition of waves and interference of light by wavefront splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Mach Zehnder interferometer. Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power

Unit- 5: Lasers **(5L)**

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO2), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity

Unit- 6: Introduction to Quantum Mechanics **(5L)**

Wave nature of Particles, Time-dependent and time-independent Schrodinger equation for wave function, Born interpretation, probability current, Expectation values, Free-particle wave function and wave-packets, Uncertainty principle.

Unit- 7: Solution of Wave Equation **(5L)**

Solution of stationary-state Schrodinger equation for one dimensional problems–particle in a box, particle in attractive delta-function potential, square-well potential, linear harmonic oscillator. Scattering from a potential barrier and tunneling; related examples like alpha decay, field-ionization and scanning tunneling microscope, tunneling in semiconductor structures. Three-dimensional problems: particle in three dimensional box and related examples.

Unit- 8: Introduction to Solids and Semiconductors (8L)

Free electron theory of metals, Fermi level, density of states in 1, 2 and 3 dimensions, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands. Types of electronic materials: metals, semiconductors, and insulators. Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p -n junction

TEXT BOOKS

1. H. J. Pain, The physics of vibrations and waves, Wiley, 2008
2. Ajoy Ghatak, Optics, McGraw Hill Education, 2017.
3. B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India, 2015.
4. D. J. Griffiths, Quantum mechanics, Pearson Education, 2015.

REFERENCE BOOKS

1. E. Hecht, Optics, Pearson Education, 2008.
2. O. Svelto, Principles of Lasers, Springer Science & Business Media, 2010.
3. D. A. Neamen, Semiconductor Physics and Devices, Times Mirror High Education Group, Chicago, 2017.

COURSE OUTCOME:

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

CO1. To acquire skills allowing the student to identify and apply formulas of optics and wave physics using course literature.

CO2. To be able to identify and illustrate physical concepts and terminology used in optics and to be able to explain them in appropriate detail.

CO3. To be able to make approximate judgments about optical and other wave phenomena when necessary.

CO4. To acquire skills allowing the student to organize and plan simpler laboratory course experiments and to prepare an associated oral and written report.

CO5. To have basic knowledge of Quantum Mechanics and Semiconductors.

SR.NO.	LIST OF EXPERIMENTS
1	(a) To determine wavelength of sodium light using Newton's Rings. (b) To determine the refractive index of a liquid using Newton's Rings.
2	To determine wavelength of sodium light using Fresnel's Biprism.
3	(a) To determine wavelength of prominent lines of mercury using plane diffraction grating. (b) To determine the dispersive power of a plane transmission diffraction grating.
4	To determine the specific rotation of cane sugar solution using bi-quartz polarimeter
5	To study the diffraction pattern of Single slit and hence determine the slit width.
6	(a) To verify cosine square law (Malus Law) for plane polarized light. (b) To study the nature of polarization using a quarter wave plate.
7	To study the variation of refractive index of the material of the prism with wavelength and to verify Cauchy's dispersion formula
8	(a) To study photoelectric effect and determine the value of Planck's constant. (b) To verify inverse square law using photocell.
9	To determine the frequency of AC mains using sonometer.
10	To determine the frequency of AC mains or of an electric vibrator by Melde's experiment
11	To measure the numerical aperture (NA) of an optical fiber.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	PY104	Subject Title	Introduction to Electromagnetic Theory						
LTP	3-1-2	Credit	5	Subject Category	UC	Year	1st	Semester	I / II

Course Outline:

Course Objective:

To teach students the effects of electric charges at rest and in motion. Both positive and negative charges produce force field which is called "electric field". Moving charges produce current, which gives rise to another force field called "magnetic field". The electromagnetic theory studies the behavior of the electric and magnetic fields.

Course Pre/Co- requisite (if any):

UNIT 1: Electrostatics in vacuum

Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction; Practical examples like Faraday's cage and coffee-ring effect; Boundary conditions of electric field and electrostatic potential; method of images; energy of a charge distribution and its expression in terms of electric field.

UNIT 2: Electrostatics in a linear dielectric medium

Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement; solving simple electrostatics problems in presence of dielectrics – Point charge at the centre of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field.

UNIT 3: Magnetostatics

Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities.

UNIT 4: Magnetostatics in a linear magnetic medium

Magnetization and associated bound currents; auxiliary magnetic field $\vec{H}$; Boundary conditions on $\vec{B}$ and $\vec{H}$. Solving for magnetic field due to simple magnets like a bar magnet; magnetic susceptibility and ferromagnetic, paramagnetic and diamagnetic materials; Qualitative discussion of magnetic field in presence of magnetic materials.

UNIT 5: Faraday's law

Faraday's law in terms of EMF produced by changing magnetic flux; equivalence of Faraday's law and motional EMF; Lenz's law; Electromagnetic breaking and its applications; Differential form of Faraday's law expressing curl of electric field in terms of time-derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi-static approximation; energy stored in a magnetic field.

UNIT 6: Displacement current, Magnetic field due to time-dependent electric field and Maxwell's equations

Continuity equation for current densities; Modifying equation for the curl of magnetic field to satisfy continuity equation; displace current and magnetic field arising from time-dependent electric field; calculating magnetic field due to changing electric fields in quasi-static approximation. Maxwell's equation in vacuum and non-conducting medium; Energy in an electromagnetic field; Flow of energy and Poynting vector with examples. Qualitative discussion of momentum in electromagnetic fields.

UNIT 7: Electromagnetic waves

The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples. Momentum carried by electromagnetic waves and resultant pressure. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

Learning Outcome

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

CO1. The use of Coulomb's law and Gauss' law for the electrostatic force

CO2. The relationship between electrostatic field and electrostatic potential

CO3. The use of the Lorentz force law for the magnetic force

CO4. The use of Ampere's law to calculate magnetic fields
CO5. The use of Faraday's law in induction problems
CO6. The basic laws that underlie the properties of electric circuit elements

Text book [TB]:

1. David Griffiths, Introduction to Electrodynamics, PHI Learning, 2012.

Reference Books [RB]:

1. Halliday and Resnick, Physics, Wiley, 2013.
2. W. Saslow, Electricity, Magnetism and Light, Academic Press, 2002.

List of Experiments:

1. To compare capacitances using De'Sauty's bridge.
2. Measurement of field strength B and its variation in a solenoid (determine dB/dx)
3. To verify the Thevenin and Norton theorems.
4. To verify the Superposition, and Maximum power transfer theorems
5. To determine self-inductance of a coil by Anderson's bridge.
6. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
7. To study the response curve of a parallel LCR circuit and determine its (a) Antiresonant frequency and (b) Quality factor Q.
8. Measurement of charge and current sensitivity and CDR of Ballistic Galvanometer
9. Determine a high resistance by leakage method using Ballistic Galvanometer.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Course Outline:

Course Objective:

The objectives of this course are to enable students to acquire and use engineering graphics skills as a means of accurately and clearly communicating ideas, information and instructions for technical communication.

Course Pre/Co- requisite (if any):

Detailed Syllabus

UNIT 1: Introduction to Engineering Graphics

Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Involutes; Scales Plain, Diagonal

UNIT 2: Projection of Points and Planes

Orthographic Projections covering, Principles of Orthographic Projections, Projections of Points and lines inclined to both planes; Projections of planes inclined Planes

UNIT 3: Projection of Solids

Projections of solids in simple position, projections of solids with axes inclined to one reference plane and parallel to other. Projections of solids with axes inclined to both of the reference plane

UNIT 4: Section of Solids and Development of Surfaces

Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone, Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone

UNIT 5: Isometric Projection and Auto CAD

Isometric Projections, Freehand Sketching, Simple and compound Solids, Conversion of Isometric Views to Orthographic Views (simple machine components according to first angle projection method), Basic AutoCAD commands & its applications

Learning Outcome

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

CO1: Be able to use Engineering Drawing Skills as a means of accurately and clearly communicating ideas, information and instructions.

CO2: Acquire requisite knowledge, techniques and attitude for advanced study of engineering drawing.

CO3: Comprehend and draw a simple engineering drawing primarily in first angle Orthographic projections.

CO4: To create section views of simple engineering objects

CO5: To understand basic AutoCAD commands and appreciate the need of AutoCAD over Manual Drafting.

Text book [TB]:

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 [RB]:

1. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.
3. Narayana, K.L. & P Kannaiah (2012), Text book on Engineering Drawing, Scitech Publishers
4. D.M. Kulkarni, A.P. Rastogi, A.K. Sarkar, "Engineering Graphics with AutoCAD" , PHI Learning Pvt. Ltd., Ist edition, 2009.
5. (Corresponding set of) CAD Software Theory and User Manuals

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	MA102	Subject Title	Engineering Mathematics-II						
LTP	3-1-0	Credit	4	Subject Category	UC	Year	1st	Semester	I / II

Course Outline:

Course Objective:

The objective of the course is to introduce the fundamentals in Matrices and Linear Algebra, Solving Ordinary Differential Equations, Convergence of an Infinite Series, Laplace Transform and Fourier Series relevant to engineering applications.

Course Pre/Co- requisite (if any):

UNIT 1: 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. Linear dependence and independence of vectors, Vector space and its basis, Matrix transformation, Rank-Nullity theorem, Eigen-values and eigen-vectors, Similar matrices, Cayley–Hamilton theorem and its applications. Diagonalization of matrices.

UNIT 2: Differential Equations

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

UNIT 3: Infinite Series

Introduction to sequences and series, Convergence and divergence, Series of positive terms, Comparison test, Cauchy's integral test, D'Alembert's ratio test, Cauchy's root test, Raabe's test, Logarithmic test, Alternating series, Leibnitz test.

UNIT 4: 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 5: 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 differential equations pertaining to engineering problems.

Learning Outcome

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

CO1. Equip the students to deal with advanced level of mathematics and applications.

CO2. Familiarity with fundamental tools of Matrices and Linear Algebra, Ordinary Differential Equations, Infinite Series, Laplace Transforms and Fourier Series.

CO3. Use of tools to solve engineering applications.

Text book [TB]:

1. R. K. Jain and S. R. K. Iyenger, Advanced Engineering Mathematics, 2nd Edition, Narosa Publishing House, New Delhi, India, 2014.
2. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, U.K., 2006.

Reference Books [RB]:

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publications, New Delhi, India, 2012.
2. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CH101	Subject Title	Engineering Chemistry						
LTP	3-1-2	Credit	5	Subject Category	UC	Year	1st	Semester	I/II

Course Outline:

Course Objective:

The objectives of this course are 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

Course Pre/Co- requisite (if any):

UNIT 1: Water Treatment and Analysis

Standards for drinking water, Water Quality parameters, Determination of alkalinity of water, Hardness of water: Units and determination. Demineralization of water.

Softening of water: Lime soda Process, Ion exchange process, Zeolite process and RO process. Internal conditioning methods: Carbonate conditioning, Phosphate conditioning, Colloidal conditioning, Calgon conditioning. Desalination of brackish water. Numerical Problems based on all these parameters.

UNIT 2: Electrochemistry & Corrosion

Electrochemical cell, Electrode potential & EMF of a Galvanic cell, Nernst Equation, Migration of ions, Transport number, Determination of Transport number by Hittorf`s method, Conductometric titrations, Types of electrode: Calomel and glass electrode, Liquid junction potential.

Corrosion and its economic 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 inibitors

UNIT 3: Polymers & Biomolecules

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); Specialty Polymers (Conducting Polymers, Silicones and Polycarbonates), Structural and functional attributes of cell and cell organelles; Biomolecules (Proteins, Carbohydrates, Lipids, Enzymes, Nucleic acids)

UNIT 4: Fuels, Battery& Lubrication

Classification of fuels, Calorific value, Cetane number, Octane number, Comparison of solid, liquid and gaseous fuel, properties of fuel, Biofuels, Power alcohol and synthetic petrol, Battery, 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

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 Nano materials, preparation of nanomaterial, self-assembly, Different Nano materials, Applications of Nano materials

Learning Outcome

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

CO1: To understand about the treatment of water, sewage water and hardness related calculation

CO2: An overview of surface coatings in order to protect the metal.

CO3: An ability to identify and formulate polymers and have a knowledge of various polymers like polythene, PVC, PS, Teflon, Bakelite, Nylon which have engineering applications. To gain acquaintance regarding biomolecules and their application in Engineering. To gain acquaintance regarding biomolecules and their application in engineering.

CO4: An overview of the working principles, mechanism of reactions and application of the building blocks like batteries, fuel cells,

CO5: 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 book [TB]:

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 [RB]:

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

List of Experiments:

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. To determine the percentage of available chlorine in bleaching powder.
4. To determine the chloride content in the given water sample by Mohr's method
5. Determination of iron content in the given ore by using External indicator
6. To determine the Dissolved Oxygen in a given water sample.
7. To determine the strength of unknown acid pH-metrically
8. To analyze the coal sample by proximate analysis.
9. To determine the Flash and Fire point of a fuel sample.
10. To determine the Viscosity of a lubricant by redwood viscometer.
11. To determine the rate constant and order of reaction
12. To determine the strength of a given solution conductometrically

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	ME105	Subject Title	Engineering Mechanics						
LTP	2-1-2	Credit	4	Subject Category	UC	Year	1st	Semester	I / II

Course Outline:

Course Objective:

The objectives of this course is to learn basics concepts of engineering mechanics and increase the ability to solve problems involving forces, loads and moments and to know their applications in allied subjects

Course Pre/Co- requisite (if any):

Detailed Syllabus

UNIT 1: Introduction to Engineering Mechanics

Basic idealizations - Particle, Continuum and Rigid body; Newton's laws of Force and its characteristics, types of forces- Gravity, Lateral and its distribution on surfaces, Classification of force systems, Principle of physical independence, superposition, transmissibility of forces, Introduction to SI units.

Couple, Moment of a couple Characteristics of couple, Moment of a force, Equivalent force - couple system; Numerical problems on moment of forces and couples, on equivalent force - couple system.

UNIT 2: Equilibrium of forces

Equilibrium of forces - Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem; Numerical problems on equilibrium of coplanar – concurrent and non-concurrent force systems

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.

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.

Plane Truss: Perfect and imperfect truss Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

UNIT 4: Center of Gravity and Centroids

Introduction to the concept, Centroids of line and area, Centroids of basic geometrical figures, computing Centroids for– T, L, I, and full/quadrant circular sections.

UNIT 5: Kinetics of Particle

Newton’s law of motion; Motion of bodies in Rectangular coordinates; D’Alembert’s Principle.

Learning Outcome

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

CO1. Identify principles of mechanics to be used for solving real life engineering problems.

CO2. Apply basic Engineering concepts based on force, shape and dimension for selection of material

CO3. Comprehend the action of Forces, Moments and other loads on systems of rigid bodies.

CO4. Compute the reactive forces and the effects that develop as a result of the external loads.

CO5. Express the relationship between the motions of bodies.

Text book [TB]:

3. Engineering Mechanics by S.S. Bhavikatti, New Age International Publisher, New Delhi, 3rd edition 2009.
4. Engineering Mechanics-Statics and Dynamics by A Nielson, Tata McGraw Hill Education Private Ltd, New Delhi, 2009.

Reference Books [RB]:

1. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education
2. Beer FP and Johnson ER, "Mechanics for Engineers- Dynamics and Statics"- 3rd SI Metric edition, Tata McGraw Hill. - 2008
5. Shames IH, "Engineering Mechanics – Statics & Dynamics"- PHI

List of Experiments:

1. Study of different types of beam.
2. Calculation and Verification of forces in truss elements.
3. Calculation and verification of equilibrium condition on beam model.
4. Calculation to find the redundant force in a truss.
5. Mechanical advantage over pulley arrangement.
6. Determining the coefficient of friction.
7. Optional Tensile Strength
8. Optional Hardness Measurement

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Course Outline:

Course Objective:

Ability to prepare simple objects using machines and machine tools to make students aware of fundamental operations of manufacturing an engineering component, enhance visualization and motivate them to innovate

Course Pre/Co- requisite (if any):

UNIT 1: Machine Shop

To make a machined-component using lathe with mild steel round bar or hexagonal bar
Comprising of common turning operations with reference to drawing given in the manual.
Any one of the following jobs
Jobs: Hex Bolt, Axle for cycle wheel, Jig Bush, a typical turning specimen.

UNIT 2: Sheet metal Shop

To make a sheet metal component with galvanized iron sheet as per the drawing provided in the manual having spot welding joint.
Any one of the following jobs
Jobs: Square tray, Scoop, Funnel

Fitting Shop

To make a joint using fitting tools with mild steel flats, round bars or square bars as per the drawing provided in the manual.

UNIT 3: Welding Shop- Arc Welding

To prepare a welding joint with mild steel flat using Manual Metal Arc welding machine according to the drawing provided in the manual.
Any one of the following jobs
Jobs: Lap joint, Butt joint, Fillet/Corner joint

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

UNIT 4: Carpentry Shop

To make a wooden joint with soft wood as per the drawing provided in the manual.
Any one of the following jobs
Jobs: T-Lap joint, Dove tail joint, Mortise & Tendon joint, Bridle joint.

UNIT 5: Foundry Shop

Introduction to foundry process like melting of metals, mould making, casting process and use of patterns to prepare of a component and significance of foundry.
Demo of mould preparation

Minor Project:

To make a minor project by the students in batches comprising the operations performed in different shops

Learning Outcome

At the end of the course, the student will be able to:
CO1: Have Capability to identify hand tools and instruments for machining and other workshop practices.
CO2: Obtain basic skills in the trades of fitting, carpentry, welding and machining
CO3: Acquire measuring skills, using standard workshop instruments & tools.
CO4: Gain eye hand co-ordination, enhance psycho motor skills and attitude.

Text book [TB]:

1. A course in Workshop Technology Vol I and Vol II by Prof. B.S. RaghuwanshDhanpat Rai & Co.(P) Ltd.
2. Elements of Workshop Technology Vol I and Vol II by S.K. Hajara Choudhury ,A.K. Hajara Choudhury & Nirjhar Roy ;Media Promoters & Publishers Pvt. Ltd, Mumbai

Reference Books [RB]:

1. WorkshopTechnology Part 1 , Part2 & Part3 by W.A.J. Chapman;CBS Publishers & Distributors, New Delhi

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS105	Subject Title	Programming for Problem solving						
LTP	3-0-4	Credit	5	Subject Category	UC	Year	1st	Semester	I / II

Course Outline:

Course Objective:

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.

Course Pre/Co- requisite (if any):

Detailed Syllabus

UNIT 1: Introduction to Computer, Programming & algorithms

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples, From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

UNIT 2: Arithmetic Expression, and Conditional statements, Loops

Expression:

Arithmetic, Logical , Relational expressions and precedence.

Loops & Branching: Writing and evaluation of conditionals and consequent branching, Iteration and loops.

UNIT 3: Arrays & Functions

Arrays: Arrays (1-D, 2-D), Character arrays and Strings.

Functions: functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference.

Searching & Sorting: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

UNIT 4: Fuels, Battery& Lubrication

Recursion:

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

Structure:

Structures, Defining structures and Array of Structures.

UNIT 5: Pointers & File handling

Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list.

File handling: different modes of opening a file in C, reading, writing from files.

Learning Outcome

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

CO1. To formulate simple algorithms for arithmetic and logical problems.

CO2. To implement conditional branching, iteration and recursion.

CO3. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

CO4. To use arrays, pointers and structures to formulate algorithms and programs.

CO5. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems

Text book [TB]:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd edition 1988, Prentice Hall of India.

List of Experiments:

1. Familiarization with programming environment.
2. Programming for Simple computational problems using arithmetic expressions.
3. Programming for Problems involving if-then-else structures.
4. Programming for Iterative problems e.g., sum of series.
5. Programming for 1-D Array manipulation.
6. Programming for Matrix problems, String operations.
7. Programming for Simple functions
8. Programming for Recursive functions.
9. Programming for Pointers and structures.
10. Programming for File operations
11. Programming for solving Numerical methods problems

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	MA202	Subject Title	Probability and Statistics					
LTP	3 1 0	Credit	4	Subject Category	AC	Year	2nd	Semester	III

OBJECTIVE: The objectives of the course are to familiarize the students with statistical techniques, to equip them with standard concepts and, to learn tools of probability theory to solve engineering problems.

Unit I: Descriptive Statistics and Probability

Review of mean, median and mode, variance. Moments and properties, Skewness and Kurtosis. Probability: concepts, definition, examples, conditional probability and Bayes' theorem.

Unit II: Random Variables and Probability Distributions

Discrete & continuous random variables and their properties, mass function, density function, distribution functions. Expectation, moment generating function, Binomial, Poisson, Exponential & Normal distributions and their applications.

Unit III: Correlation and Regression

Bivariate distributions and their properties, Joint and marginal density functions, Conditional densities. Covariance, Correlation, Regression, Regression lines. Curve fitting by the method of least square- fitting of straight lines.

Unit IV: Hypothesis Testing

Population and samples, Sampling distribution of statistic, standard error. Null and Alternative Hypothesis, critical region, critical values and level of significance. One tail and two-tail tests, confidence interval, Errors in testing of hypothesis; Type I and Type II errors, power of the test.

Unit V: Inferential test procedures

Test of significance, large sample test for single proportion, difference of proportion, single mean, difference of means and difference of standard deviation. Small sample test: Student's t-test and it's applications, F-test and it's applications. Chi-square test for goodness of fit and independence of attributes.

LEARNING OUTCOME: Students will be able to:

- Compute probability, various discrete and continuous probability distributions of random variables and their properties.
- Use the tools of statistics including measures of central tendency, correlation and regression.
- Use statistical methods for studying data samples.
- Use large sample and small sample tests.

Text Books:

1. S. Palaniammal, Probability and Random Processes, PHI learning private ltd., 2015.
2. S.C. Gupta, Fundamentals of Statistics, 7th Ed., Himalaya Publishing House, 2018.

Reference Books:

1. S.C. Gupta, V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, 2016.
2. Richards A Jonson, Irvin Miller and Johnson Freund, Probability and Statistics for Engineering, 9th Edition, PHI, 2011.
3. S. Ross, A First Course in Probability, 8th Ed., Pearson Education India, 2010.
4. M.R. Spiegel, J.J. Schiller and R.A. Srinivasan, Probability and Statistics, Schaum's Outlines, 2013.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC201	Subject Title	ELECTRONIC DEVICES AND CIRCUITS (2018-onwards)						
LTP	3 1 2	Credit	5.0	Subject Category	Deptt. Core	Year	2nd	Semester	III

OBJECTIVE:

To Understand

- The behaviour of charge carriers in Crystalline semiconductors
- Principles of p-n junction diode
- Working principles of Bipolar Junction Transistor
- Characteristics of Field Effect Transistors

Unit I : Fundamentals of semiconductors:

Crystalline solids, Energy bands in crystals, Statistical mechanics, Equilibrium electron and hole concentrations in semiconductor crystals, Intrinsic and Extrinsic semiconductors, Non – degenerate and degenerate semiconductors. Elemental and compound semiconductors and their properties.

Unit II: Carrier transport in semiconductor:

Carrier Transport in Semiconductors: – Drift and Diffusion currents, Einstein Relation, Hall Effect, , Excess carriers in semiconductors, Excess carriers and Quasi-Fermi Levels, Generation and Recombination, Basic equations for semiconductor device operation.

Unit III: P-N Junctions:

The abrupt junction: Energy bands in Thermal Equilibrium and biased conditions, Current flow in junctions, V-I characteristic of an ideal diode, Comparison with real diode, C – V characteristics of reverse biased p-n junctions, breakdown in reverse bias, DC and ac equivalent circuit of a p-n junction diode, Characteristic parameters of a diode.

Unit IV: Bipolar Junction Transistor:

Structure, Principle of operation, Ebers – Moll Model, Input and output characteristics, Punch through and Avalanche multiplication in BJT Early effect, Effect of high Injection, Transfer characteristics of BJT, DC equivalent circuits of BJT, Small signal-Low frequency/High Frequency equivalent circuit of BJT, Unity Gain Bandwidth ,Characteristics Parameter of BJT.

Unit V: JFET and MOSFET:

Junction Field Effect Transistor:-Structures, Qualitative Description of Output characteristics

Metal Oxide Semiconductor Field Effect Transistor:-Structure, Qualitative Description of MOS capacitor behavior and output characteristic of MOS field Effect Transistor, Characteristics parameters of MOSFET, Small signal Equivalent circuit of MOSFET.

LEARNING OUTCOME:

The course provides an understanding of:

- Understand various semiconductors and their characteristics.
- Apprehend carrier transport in semiconductor.
- Analyze PN junction diode and its characteristics for various applications.
- Understand various types of diode and its characteristics.
- Analyze characteristics of BJT, JFET and MOSFET.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

List of Experiments:

1. Identification and testing of passive and active components
2. Measurement of I – V characteristic if p – n junction diode
3. Determination of diode parameters
4. Measurement of input and output characteristic parameters of BJT for common emitter configuration
5. Measurement of input and output characteristic parameters of BJT for common base configuration
6. Measurement of input and output characteristic parameters of BJT for common collector configuration
7. Determination of small signal model parameters of BJT
8. Measurement of I-V characteristics of JFET.
9. Measurement of I-V characteristics of MOSFET.
10. Study of switching behavior of BJT.
11. Study of switching behavior of MOSFET.

List of two value added Experiments

1. Study of I-V characteristics of solar cell.
2. Study of I-V characteristics of photo transistor.

Text Books:

1. Tyagi M.S., "Introduction to Semiconductor Materials and Devices", John Wiley & Sons, 1993.
2. Streetman B.G., Banerjee, S.K, "Solid State Electronic Devices", Pearson Education, 6th Edition 2006.

Reference Books:

1. Sze S.M., "Semiconductor Devices Physics and Technology" John Wiley & Sons, 2nd Edition 2002.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC 202	Subject Title	DIGITAL SYSTEM DESIGN						
LTP	3 0 2	Credit	4.0	Subject Category	Deptt.core	Year	2nd	Semester	III

OBJECTIVES:

- To acquire the basic knowledge of digital logics and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital electronic circuits.

UNIT I-INTRODUCTION:

Number Systems, Basic & Universal Logic gates, Boolean algebra, Direct Conversion of various base, Negative number representations, Floating point number representation, BCD & EXCESS-3 arithmetic, Error detecting and correcting codes: Hamming code, parity code, Review and Limitation of K-Map, Quine-Mcclusky Method (Tabular Method). **10L**

UNIT II-COMBINATIONAL LOGIC CIRCUITS:

Characterization of digital circuits: Combinational & Sequential Logic circuit.

Design Procedure-Arithmetic Circuits: Adders, Subtractors, Parallel Adder, BCD Adder, and Multiplier.

Design Procedure-Switching Circuits: Decoder, Encoder, Priority Encoder, Multiplexers, Demultiplexers and their applications, Magnitude Comparators.

Design Procedure-Other Circuits: Parity checker and generator,

Code Conversion: Binary to BCD, BCD to Binary, BCD to Excess-3, Excess-3 to BCD. **9L**

UNIT III-SEQUENTIAL LOGIC CIRCUITS:

Latches: SR, S $\overline{R}$ ($\overline{S}$ Bar and R bar), D latch. Race around condition, Propagation Delay.

Flip-Flops: SR, D, JK & T Flip Flops and their conversions, Master-Slave Flip Flop, Edge Triggered Flip-Flop, Characteristic Table, Characteristic Equation, State Table, State Diagram, Excitation Table & Diagram, Analysis with JK Flip-Flop, Design Procedure of Sequential Circuits, Designing with unused states.

Finite State Machine: Mealy and Moore Models. **6L**

UNIT IV-APPLICATION OF SEQUENTIAL LOGIC CIRCUITS:

Registers: Registers with Parallel Load, Serial Transfer, Shift Registers with Parallel Load, Bidirectional Shift Register, Universal Register.

Counters: Asynchronous Counters-Ripple Up and Down Counters using JK Flip-Flop, impact of Propagation delay.

Counters: Synchronous Counters - Binary Counter, Counter with D Flip-Flop, Up & Down Counters, BCD/Decade Counters. **8L**

UNIT V-LOGIC FAMILIES & PROGRAMMABLE LOGIC DEVICES:

Logic Families: Diode, BJT & MOS as a switching element, concept of transfer characteristics, ECL, TTL, I2L, Tri-state, PMOS, NMOS and CMOS logic families- Power Consumption, Gate delay and Figure of merit (SPP), Package density, Comparison of standard logic families, pass transistor Logic, Open Collector and Totem pole output stage for TTL.

6L

Text Books:

1. Digital Design, M. Morris Mano and M. D. Ciletti, 4th Edition, Pearson

Reference books:

1. Digital Systems: Principles and Design, Raj Kamal, Pearson
2. Maini, Digital Electronics: Principles and Integrated Circuits, Wiley India.
3. Switching Theory and Finite Automata, Kohavi, TMH Publications.

OUTCOME OF THE COURSE:

- To understand and examine the structure of various number systems and its application in digital design
- Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
- The ability to understand, analyze and design various combinational and sequential circuits.
- To develop skill to build digital circuits.

List of Experiments:

1. Implementation of All Logic Gates using Universal gates (NAND & NOR both).
2. Bread-board implementation (Parallel adder, One bit Multiplier, One bit Magnitude comparator, parity checker)
3. Bread-board implementation of any one code converter (i.e. Gray Code, BCD Code, Excess-3, Hex. etc.).
4. Design of shift registers (SISO, SIPO, PIPO, and PISO), up and down counters.
5. Design of Mod-6 types of Asynchronous Counters.
6. Transfer characteristics of TTL and CMOS inverters.
7. Realization of Decoder, Multiplexer, encoder and De-multiplexers using IC 74138.
8. To design & Implement PAL.
9. To design & implement PLA.
10. Clock circuit realization using 555, CMOS inverter.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC 203	Subject Title	SIGNALS & SYSTEMS						
LTP	3 0 0	Credit	3.0	Subject Category	Deptt.core	Year	2nd	Semester	III

Objective of the Course:

- To develop basic knowledge of signals and systems and its properties in Continuous time and Discrete time domain.
- To understand the concepts and applications of Continuous Time and Discrete Time Fourier Series/Transforms.
- To characterize and analyse signals and systems in time as well as frequency domain.
- To understand the concepts of Sampling and aliasing.

UNIT I-TIME-DOMAIN ANALYSIS OF SIGNALS & LTI SYSTEMS:

Signals: Definition of Continuous Time (CT) and Discrete Time (DT) signals, Properties of CT & DT Signals, Operations on signals.

Systems: Types of Systems, Definition of CT & DT systems, system properties, Impulse response and the convolution integral and convolution summation, Properties of convolution, Analysis of LTI systems. **9L**

UNIT II-FREQUENCY DOMAIN ANALYSIS OF CT SIGNALS AND LTI SYSTEMS:

Fourier series (FS): Exponential FS and its properties, Continuous Time Fourier Transform (CTFT): Definition & Properties, Frequency Response of LTI systems.

Laplace Transform (LT): RoC, Properties and Applications. Relationship between Laplace transform and CTFT **10L**

UNIT III-FREQUENCY DOMAIN ANALYSIS OF DT SIGNALS:

Sampling Theorem for Low Pass Signals, Nyquist Criterion, Aliasing, Discrete-Time Fourier Series, Discrete-Time Fourier Transform - Definition & Properties. **8L**

UNIT IV-FREQUENCY DOMAIN ANALYSIS OF DT SYSTEMS

Difference equation representation of I/O relationship, System properties in terms of the impulse response using DTFT, System response for complex-exponential inputs. **6L**

UNIT V- Z-TRANSFORM:

Z-transform: Definition, existence and motivation, Evaluation of ZT, ROC and its Properties, Inverse ZT, Relationship between DTFT and z-transform, ZT Properties. **6L**

Text Books:

1. Signals and Systems, Oppenheim and Willsky with Nawab, 2nd Edition, Prentice Hall, 1997

Reference books:

1. Linear Systems and Signals, B. P. Lathi, Oxford Press, 2nd Edition.
2. Signals and Systems, Tarun Kumar Rawat, 1st Edition, Oxford University Press, 2011
3. Signals and Systems, H P Hsu, Second Edition, Schaum's Outlines, Mc Graw Hill Education

OUTCOME OF THE COURSE:

- Classify various signals and systems (continuous and discrete) based on their properties.
- Determine response of LTI systems using graphical or mathematical convolution.
- Perform sampling of Continuous time signals using Nyquist criterion.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC 204	Subject Title	ELECTROMAGNETIC FIELD THEORY						
LTP	3 1 0	Credit	4.0	Subject Category	Deptt.core	Year	2nd	Semester	III

Objective of the Course: To understand

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

UNIT I-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 II-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 III-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 IV-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 V-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. **7L**

Text Books:

1. Elements of Electromagnetics, M N O Sadiku.

Reference Books:

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

OUTCOME OF THE COURSE:

- To acknowledge students about electric field and magnetic field.
- To get acquaints students with the basic idea of electromagnetic wave, characteristics of electromagnetic waves.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EE 209	Subject Title	CIRCUIT ANALYSIS AND SYNTHESIS						
LTP	3 1 2	Credit	5.0	Subject Category	Deptt.core	Year	2nd	Semester	III

Objectives of the Course:

- To provide basic understanding of the different types of continuous time signals and systems and their mathematical representation.
- To provide knowledge of graph theory applicable for analysis of electrical circuits. The students will understand of different two port network parameters.

UNIT I-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.

Analogous System: Mechanical elements for translational and rotational systems, force-voltage and force-current analogy, torque-voltage and torque-current analogy. **8L**

UNIT II-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 III-NETWORK THEOREMS (APPLICATIONS TO AC NETWORKS) ANDNETWORK FUNCTIONS:

Super- position theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem.

Network Functions: 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. **8L**

UNIT IV-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. **7L**

UNIT V-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**

Text Books:

1. William Hayt, Jack Kemmerly, Steven Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, 8th Edition
2. Choudhary D. Roy, "Network & Systems", Wiley Eastern Ltd.

Reference Books:

1. Kuo, "Network Analysis & Synthesis", Wiley India.
2. Jagan, "Network Analysis", B S Publication.
3. ME Van-Valkenberg; "Network Analysis", Prentice Hall of India

OUTCOME OF THE COURSE:

- *An ability to design and analyze 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 cascade connection of 2, two -port networks.
6. To find Z and Y parameters of two-port network.
7. Time domain analysis of parallel RLC circuit using MULTI-SIM software.
8. To find current through and voltage across different elements of a given network using MULTI-SIM software.
9. Determination of transient response of current in RL circuit with step voltage inputusing MULTI-SIM software.
10. Determination of transient response of current in RC circuit with step voltage inputusing MULTI-SIM software.

List of two value added Experiments

1. Verification of superposition theorem using MULTI-SIM software.
2. Verification of reciprocity theorem using MULTI-SIM software.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	HS201	Subject Title	Aptitude and Soft Skills I						
LTP	2 0 0	Credit	0	Subject Category	AC	Year	II	Semester	III

Course Outline: This is a module having basics of aptitude coupled with Soft Skills to help students set the tone for aptitude training to create readiness for campus placement and various competitive exams for Government & non-corporate set-ups. The various tools used in the classes will help them rediscover & reinvent themselves.

Course Objective:

1. Prepare students for becoming confident and corporate-culture fit
2. Get them equipped with the aptitude tools to handle workplace stressors and manage time properly
3. Help them improve their interpersonal skills

Course Pre/Co- requisite (if any): Basic understanding of elementary Mathematics and Logical reasoning and basic understanding of Soft Skills.

Detailed Syllabus

UNIT 1: QUANTITATIVE APTITUDE **05 hours**

Simplification:Duplex method for finding square; Vedic mathematics tricks for multiplication of 2, 3, 4 digit numbers; BODMAS application, Finding square roots and cube roots; Introduction to Surds and Indices.
AgesProblems based on ages solving with algebraic equations; Concept of hence time and past time.
Averages**:** Basic Concepts; Weighted Average; Basic understanding of mean, median and mode; Application of average on ages, speed time distance and series.

UNIT 2: VERBAL APTITUDE **05 hours**

Sentences- Types of sentences, Parts of Speech**-** application based approach.
Vocabulary: Understanding word structure, common roots, prefixes, suffixes, Mnemonic method.
Speed Reading**:** Easy to medium passages-techniques and practical applications, Idioms and phrases.
Activities-Words from Dictionary, Newspaper and other sources (theme based).

UNIT 3: LOGICAL REASONING **06 hours**

Clock and Calendar, Cubes – Structure of cube, cutting rules, cutting the painted cube into identical cubelets and Dice reasoning – rule detection, pattern completion, image analysis.
Missing Number, Mathematical operation, Inequality, Number puzzles.

UNIT 4: SELF-ANALYSIS & INTERPERSONAL SKILLS05 hours

MBTI and other personality tests, strategies to develop interpersonal skills.
Suggested Activities & Games: (i) I Am (ii) Flip (iii) A Letter to Yourself, (iv) Card Pieces, (v) Blindfold Game, (vi) Crazy Comic.

UNIT 5: PRESENTATION SKILLS **05 hours**

Principles of Effective Presentations, Do's and Don'ts of Formal Presentations, How to prepare for a formal presentation, Presentation Exercises a) Welcome speech, c) Farewell Speech, d) Vote of thanks etc.
Suggested Activities & Games: (i) Stand Up for Fillers, (ii) Mimes, (iii) Short Speech Challenge.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Learning Outcome

1: Get to know more about their personality and gain people skills.

2: Be able to deliver presentations more confidently.

3: Will have a firm base ready for the upcoming years for the aptitude part.

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- The Power of Now- Eckhart Tolle, Yogi Impressions Books Pvt. Ltd.-2010.

Reference books [RB]:

1. Quantitative Aptitude:Quantitative Aptitude for Competitive Examinations- R.S. Agarwal S. Chand Publications-2018.
   Quantitative Aptitude: Quantitative Aptitude- Saurabh Rawat and 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: Fun with grammar- Suzanne W. Woodward Pearson Education ESL-1996.
4. Soft Skills- The Greatness Guide – Robin Sharma, Jaico Publishing House- 2006.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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)

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC 205	Subject Title	DIGITAL SIGNAL PROCESSING						
LTP	3 1 2	**Credit**	5.0	**Subject Category**	Deptt.core	**Year**	2nd	**Semester**	IV

Objectives:

- To understand the Basic Concept & Characteristics of DSP systems.
- To Learn the Concept of Efficient & High Speed Computation in DSP with various algorithms and Transformations.
- To understand the concepts & realizations of Digital Filters.
- To develop the skills of modeling of DSP Systems.

UNIT I-DISCRETE FOURIER TRANSFORM:

Frequency Domain Sampling: The Discrete Fourier Transform, Frequency Domain Sampling and Reconstruction of Discrete-Time Signals, Discrete Fourier Transform (DFT), Properties of DFT, DFT as a linear Transformation. Relationship of the DFT to Other Transforms, Multiplication of two DFTs and Circular Convolution, Additional DFT Properties.

7L

UNIT II-FAST FOURIER TRANSFORM: AN EFFICIENT COMPUTATION OF DFT:

Efficient Computation of the DFT: FFT Algorithms, Computational Complexity of Direct Computation of the DFT, Radix-2 FFT algorithms, Efficient computation of the DFT of two real sequences, efficient computation of the DFT of 2N-Point real sequences. **7L**

UNIT III-IMPLEMENTATION OF DISCRETE-TIME LTI SYSTEMS:

Realization of Discrete-Time LTI Systems (FIR Filter Structure): Direct form, Linear Phase Structure, Cascade form, Frequency sampling structures, lattice structures.

Realization of Discrete-Time LTI Systems (IIR Filter Structure): Direct form I & II, Cascade form, parallel form Lattice Structures, Signal flow graphs and transposed structures. **8L**

UNIT IV-DESIGN OF FIR FILTERS

Designing of FIR Filters: Symmetry and Anti-symmetry FIR filters, Properties & Design Constraints of FIR Filter, Designing of FIR linear phase FIR filters using Window functions (Rectangular, Hanning, Hamming & Kaiser Window Functions), Designing of FIR linear phase FIR filters using frequency sampling method. **9L**

UNIT-V: DESIGN OF IIR FILTERS:

Design of IIR Filters from Analog Filters: Properties & Design Constraints of IIR Filter, Designing of IIR filters by approximation of derivatives, impulse invariance method, IIR filter Design by Bilinear Transformation, Characteristics of commonly used analog filters (Butterworth/Chebyshev filter). **8L**

Text Books:

1. Proakis, J.G. &Manolakis, D.G., "Digital Signal Processing: Principles Algorithms and Applications", PHI.
2. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice- Hall India.
3. Tarun Kumar Rawat, "Digital Signal Processing", Oxford University Press Publications.

Reference books:

1. Rabiner, L.R. and Gold B., "Theory and applications of DSP", PHI.
2. Thomas J, Cavichhhi, "Digital Signal Processing", John Wiley & Sons
3. Roman KUC, Digital Signal Processing, BSP Hyderabad
4. Apte, "Digital Signal Processing", 2nd Edition, John Wiley (India), 2009.
5. Roman Kuc "Introduction to Digital Signal Processing" BSP, Hyderabad.

OUTCOME OF THE COURSE:

- Students will be able to learn the basic principle and characteristics of DSP Systems.
- Students will be able to develop the concept of designing of DSP Systems.
- Students will be able to model the DSP systems practically using MATLAB software.
- Students will be able to characterize the DSP System and then they will be able to analyze the performance of the systems.

List of Experiments:

1. Introduction to MATLAB Software and WAP to generation basic DT-Signals (Unit Impulse, Unit Step, Unit Ramp & Exponential Signals).
2. WAP to plot Real, Imaginary Phase and Magnitude of Exponential Function.
3. Study and Plot the aliasing effect by using Sinusoidal signal. Show the plots continuous and sampled signal using subplot.
4. WAP to find the Linear and Circular Convolutions.
5. WAP to Verify the Properties of DTFT: Symmetry, Time Shifting & Modulating with a rectangular pulse of length 21.
6. Verify the Properties of DFT.
7. Study the different window functions in FDA Tool Box of MATLAB with their controlling Parameters.
8. FIR Filter design according to given specifications and control parameters with desired filter length.
9. IIR Filter design according to given specifications and control parameters with desired filter length.

List of value added Experiments

1. FIR Filter design and analysis with various transformations.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC206	Subject Title	DISCRETE ANALOG CIRCUITS						
LTP	3 0 2	Credit	4.0	Subject Category	Deptt.core	Year	2nd	Semester	IV

Objectives:

To understand

- The working principles of basic diode and transistor based circuits.
- The methodology for analysis and design of the amplifiers, oscillators and regulated power supply.

UNIT I:

PN Junction Diode Applications:-

Review of diode characteristics and circuit models. Diode application as rectifier, voltage regulator, clipper, clamper, switch, Photodiode and LED. **8L**

UNIT II:

Applications of BJT-1:-

Transistor biasing, stabilization of Q-point, Review of small signal models of BJT, Small signal analysis of BJT amplifier (CE, CB, CC), and Differential amplifier. **10L**

UNIT III

Applications of BJT-2:-

Multistage amplifiers, Power amplifiers-Class A, B, C, AB and D.

Oscillators-Conditions of oscillation, Hartley, Colpitt, Wein Bridge, RC phase shift and Quartz crystal Oscillator. **9L**

UNIT IV:

MOSFET applications:-

MOSFET as an amplifier-Biasing, CS, CG and CD amplifiers and their small signal analysis.

MOSFET as a controlled switch, Implementation of UNIVERSAL gate. **6L**

UNIT V:

Design:

Design of a Two stage Amplifier with a midband gain of 80 dB , Design of 5 Volt-5 Ampere regulated power supply, Design of Push--Pull class B Amplifier using complimentary symmetry pair transistor.

OR Any other similar 2/3 design problems **6L**

Text Books:

1. Sedra and Smith, "Microelectronics Circuits-Theory and applications", Oxford University Press,7th edition, 2015

Reference books:

1. Millman and Halkias, "Millman's Electronic Devices & Ciruits" . McGraw Hill Education, 4th Edition, 2015
2. Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson 11th Edition, 2015
3. Donald A. Neamen, "Electronic Circuits -Analysis and Design", McGraw Hill Education, 3rd Edition..

OUTCOME OF THE COURSE:

Student will be able to design:

- Voltage regulators, clippers and clampers.
- BJT and MOSFET based single stage and multistage amplifiers.
- Oscillators circuits

List of Experiments:

1. Study of half wave, full wave rectifiers and filter circuits.
2. Study of Diode as voltage regulator.
3. Study of diode based clipper and clamper circuits.
4. Biasing of BJT for use as amplifier.
5. Measurement of frequency response of CE amplifier.
6. Measurement of gain and input resistance and frequency response of emitter follower.
7. Study of CS amplifier.
8. Study of Class B push pull BJT based amplifier.
9. Study of Hartley and Colpitt oscillator.
10. Study of Wien Bridge oscillator.
11. Study of RC phase shift oscillator.

List of Two Value Added Experiments:

1. Design of BJT based amplifier with gain of 80 dB
2. Design of 5V-1A regulated power supply.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC207	Subject Title	PRINCIPLES OF ANTENNA & WAVE PROPAGATION						
LTP	3 0 2	Credit	4.0	Subject Category	Deptt.core	Year	2nd	Semester	IV

Objectives:

- To understand basic terminology and concepts of Antennas.
- To attain knowledge on the basic parameters those are considered in the antenna design process and the analysis while designing the antenna.
- Analyze the electric and magnetic field emission from various basic antennas and mathematical formulation of the analysis.
- To have knowledge on antenna operation and types as well as their usage in real time field.
- Aware of the wave spectrum and respective band antenna usage and also to know the propagation of the waves at different frequencies through different layers in the existing layered free space environment structure

UNIT I: FIELD RADIATIONS & ANTENNA PARAMETERS:

Radiation: Review of electromagnetic fields, plane wave & uniform plane wave in free space, Retarded potential and Physical concept of electromagnetic radiation.

Antenna Parameters: Isotropic radiators, Radiation pattern, Gain, Directive gain, Directivity, effective aperture and length, radiation resistance, antenna beam width, antenna bandwidth, antenna beam efficiency, antenna beam area or beam solid angle. **8L**

UNIT II : BASIC ANTENNAS & PARAMETER MEASUREMENT:

Radiation from Small Electric Dipole, Quarterwave Monopole and Halfwave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam-widths, Directivity, Effective Area and Effective Height.

Antenna measurement: Measurements of antenna efficiency, polarization measurement. Reciprocity theorem & its applications. **9L**

UNIT III: ANTENNA ARRAYS:

Antenna Arrays: Introduction, various forms of antenna arrays, arrays of point sources, non- isotropic but similar point sources, multiplication of patterns, arrays of n-isotropic sources of equal amplitude and spacing (Broad-side & End-fire array cases), array factor, directivity and beam width, array of n-isotropic sources of equal amplitude and spacing end-fire array with increased directivity, Dolph-Tchebysceff arrays, binomial arrays.

9L

UNIT IV: PRACTICAL ANTENNAS:

Folded dipole antenna, Yagi-Uda antenna, loop antennas, helical antenna, Rhombic antenna, frequency independent antennas, horn antenna, slot antenna, microstrip or patch antennas, scanning antennas, Smart Antennas, and microwave antennas. **6L**

UNIT V: FREE SPACE WAVE PROPAGATION:

Wave Propagation: Introduction, structure of atmosphere, basic idea of ground wave, surface wave, and space wave propagation, tropospheric propagation and duct propagation. **6L**

Text Books:

1. Krauss J D, "Antennas", 4th edition, McGraw - Hill Inc., New York (1991).
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.

Reference Books:

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd ed., 2005.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. Elements of Electromagnetics, M N O Sadiku, 2012.

OUTCOME OF THE COURSE: Student will be:

- Aware of parameter considerations like antenna efficiency, beam efficiency, radiation resistance etc. in the design of an antenna.
- Capable to analyze the designed antenna and field evaluation under various conditions and formulate the electric as well as the magnetic fields Equation set for Far field and near field conditions.
- Understand the Array system of different antennas and field analysis under application of different currents to the individual antenna elements with their design issues
- Knowledge about the means of propagation of Electromagnetic wave i.e. free space propagation and also about frequency dependent layer selection, its respective issues for an effective transmission of information in the form of EM wave to a remote location and related issues.

List of Experiments:

1. Study the Antenna Transmitter and Receiver trainer for different type of Antenna.
2. Draw the radiation pattern & find the characteristics of dipole (half-wave) antenna.
3. Draw the radiation pattern & find the characteristics of folded dipole antenna.
4. Draw the radiation pattern & find the characteristics of Yagi uda antenna.
5. Draw the radiation pattern & find the characteristics of horn antenna.
6. Draw the radiation pattern & find the characteristics of log periodic antenna.
7. Draw the radiation pattern & find the characteristics of loop antenna.
8. Draw the waveform of different lobe of different Antennas using antenna trainer
9. To study different types of Microwave components.

List of value added Experiments:

1. Study & visit the Microwave Station/ TV Transmitter/Radio Transmitter & prepare a Project Report.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC208	Subject Title	COMPUTER ORGANIZATIONS & MICROPROCESSOR						
LTP	3 0 0	Credit	3.0	Subject Category	Deptt.core	Year	2nd	Semester	IV

Objectives of the Course: To teach the basic concepts of microprocessor, architecture and memory. To develop the understating of memory and peripheral related operations with microprocessor

UNIT I: Introduction to Register Transfer and Micro operation& Computer Arithmetic:

Register Transfer and Micro operation: Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Arithmetic, Logic, Shift Micro-operation, Design of ALU, Design of Fast adder.

Computer Arithmetic: Introduction, addition and subtraction algorithms, Booth Multiplication Algorithms, floating point arithmetic operation, IEEE format for floating point numbers. **8L**

UNIT II: Processor Organization & Control Design:

Processor Organization: General register organization, Stack organization, Addressing modes, Instruction format, Data transfer & manipulations, Program Control.

Control Design: Single and multiple bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Micro programmed Control, microinstruction format. **8L**

UNIT III:Input-Output Organization:

Input-Output Organization: I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory Access, Input-Output processor, Serial Communication. **6L**

UNIT IV: Memory Organization:

Device Fundamentals & types of Memory: Tristate devices, buffers, encoder, decoder, latches, Internal memory, semiconductor main memory, cache memory, Magnetic disk, CDROM, magnetic tape, partitioning, paging, virtual memory.

Memory Organization: Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of Cache Memory, Memory management hardware. **10L**

UNIT V: 8085MICROPROCESSORARCHITECTURE:

Register organization, 8085 Microprocessor Architecture, Address, Data and Control Buses, Pin Functions, De-multiplexing 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**

Text Books:

1 Ramesh S. Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, Penram International.

2. William Stalling, “Computer Organization and Architecture”, 4th Edition, PHI.

3. Douglas V. Hall, “Microprocessors and Interfacing: Programming and Hardware”, Tata McGraw Hill Ed.

Reference Books:

1. Hayes, “Computer Architecture and Organization”, MH.

2. M. Morris Mano, “Computer System Architecture”, Prentice-Hall of India, Pvt. Ltd., Third edition.

OUTCOME OF THE COURSE:

- Study basic computer organization, design and micro-operations.
- Understanding of CPU functioning and computer arithmetic.
- Learning various methods and techniques of memory organization.
- Introduction to the Architecture of the microprocessor 8085.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC209	Subject Title	IC APPLICATIONS						
LTP	3 0 2	Credit	4.0	Subject Category	Deptt. core	Year	2nd	Semester	IV

Objectives of the Course:

- To understand the working of operational amplifier and other analog / special function ICs such as wave shaping ICs, ADC, DAC, PLL.
- To analyse and design the circuits based on the these ICs

UNIT I:

Discrete analog circuits vs. Integrated circuits, Introduction to monolithic and hybrid integrated circuits.
Types of amplifiers: voltage (VCVS), current (CCCS), trans-conductance (VCCS) and trans-resistance (CCVS) amplifiers.
Operational amplifier: Ideal op – amp, internal block diagram of op-amp (for IC741). Practical op – amp: - Transfer characteristic and equivalent circuit of op-amp, Characteristic parameters of practical op-amp, data sheet of IC741. 6L

UNIT II:

Review of differential amplifier, current mirrors and their use as active load and for biasing.
Feedback topologies: series –series, series – shunt, shunt – series, shunt – shunt feedback and their effect on circuit parameters. 8L

UNIT III:

Open loop and closed loop configurations of op-amp.
Op-amp applications: Inverting and non – inverting amplifiers, Voltage Follower, V-to-I and I-to-V converters, Instrumentation amplifier, Integrator, Differentiator, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper & clamper, Low-pass, high-pass and band-pass Butterworth filters 12L

UNIT IV:

Special Function ICs:
IC 555 Timer and its applications, Waveform generator IC 8038, Introduction to Phase Locked Loop (PLL), its characteristic parameters and applications for FM detection, FSK modulation / demodulation and frequency synthesis, Three terminal voltage regulator – IC 723. 8L

UNIT V:

Digital to Analog Converter (DAC) : R – 2R ladder type DAC, Characteristic parameters of DAC.
Analog to Digital Converters: Sample and Hold Circuits, Flash and Successive approximation type ADC, Dual Slope ADC, Characteristic parameters of ADC. 8L

Text Books:

1. Sergio Franco, Design with operational amplifiers and analog integrated circuits, 3rd Edition, Tata McGraw-Hill, 2007.
2. Ramakant A.Gayakwad, OP-AMP and Linear ICs, Prentice Hall / Pearson Education, 4th Edition, 2001.

Reference books:

1. D. Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 2000
2. S. Salivahanan & V.S. Kanchana Bhaskaran, Linear Integrated Circuits, TMH, 2008
3. J. Michael Jacob, Applications and Design with Analog Integrated Circuits, Prentice Hall of India, 1996.

OUTCOME OF THE COURSE:

The student is expected to :

- Understand the functioning of operational amplifiers and be able to design OP-Amp based functional blocks.
- Understand the functioning of special functions ICs such as 555 timer ,PLL ,ADC,DAC and be able to design applications around these ICs

List of Experiments:

1. Study of OP-Amp based Inverting and non-inverting voltage follower circuits.
2. Measurement of DC parameters of OP-Amp.
3. Study of frequency response of Operational amplifier.
4. Study of OP-Amp based analog adder and subtractor.
5. Study of sample and hold amplifier and peak detector.
6. Study of OP-Amp based I to V and V to I converter.
7. Study of OP-Amp based half wave and full wave precision rectifier.
8. Study of OP-Amp based astable multivibrator.
9. Study of IC 555 based monostable and astable multivibrator.
10. Study of 8038 waveform generator.
11. Study of PLL IC 565.
12. Study of OP-Amp based BPF.

List of two value added Experiments:

1. Study of Instrumentation amplifier.
2. Study of ADC IC 0800.
3. Study of design based regulated power supply.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	HS204	Subject Title	Aptitude and Soft Skills II						
LTP	2 0 0	Credit	0	Subject Category	AC	Year	II	Semester	IV

Course Outline: This module is focused on providing students more hands-on practice on aptitude problems and prepare a stronger fundamental base for Aptitude and Soft Skills III and IV. Employability skills will help students improve their employability.

Course Objective:

1. Prepare a ground for the students to be ready in Quantitative, Logical Aptitude and Verbal Aptitude
2. Prepare them for becoming confident and corporate-culture fit as present-day workplace requires professionals who are not only well qualified and competent but also possess Soft Skills like interpersonal skills and good presentation skills

Course Pre/Co-requisite (if any): Basic understanding of simplification and calculation tricks, non-verbal pattern completion LR, covered in Aptitude and Soft Skills I.

Detailed Syllabus

UNIT 1: QUANTITATIVE APTITUDE **06 hours**

Basic algebraic equations (linear equations in one variable), polynomials and Algebraic Inequalities; logarithm.
Quadratic Equations (concept of determinant, real, non-real, rational and conjugate roots); Geometry and Mensuration; Heights and Distances.

UNIT 2: VERBAL APTITUDE **04 hours**

Figures of speech; Determiners.
Creative Writing: Essay, Report Writing, Article, Letters, E-mail, difference between formal and informal tone, appropriate use of transition words, creating a signature, understanding different situations and the responses they require (situation- based writing), Proper use of connectors.

UNIT 3: LOGICAL REASONING **05 hours**

Input Output – Sequential output tracing of logical operations applied on machine input, Ranking and Order- Test - Ordering of measurable attributes like height / weight / performances, etc.
Eligibility test, Logical sequences and series, Completion of incomplete pattern, Odd figures or Odd man out, Analogies, Coding Decoding basics.

UNIT 4: LEADERSHIP & TEAM BUILDING SKILLS **05 hours**

Importance, How to develop Leadership Skills? Best Leadership & Team Building Examples.
Suggested Activities & Exercises: (i) Leadership Pizza, (ii) Minefield, (iii) Leaders You Admire.

UNIT 5: EMPLOYABILITY SKILLS & CV WRITING **06 hours**

What Skills Do Employers Expect From Graduates? CV vs. Resume, CV writing Do's & Don'ts, Tips with Best Examples/ Samples, Feedback Sharing & Error Analysis.

Suggested Activities & Exercises: (i) Relevant Videos on 'Employability', (ii) Group Discussions on Newspaper Articles, (iii) Sample correction, (iv) writing exercise.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Learning Outcome

1: Develop Leadership & Team Building Skills.
2: Receive hands-on guidance to develop an effective CV.
3: The students would be able to understand the basic trends of questions asked in the aptitude part of placements.

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 Verbal & Non-Verbal Reasoning by R.S.Aggarwal, S Chand Publishing; 2nd Colour edition-2018.
3. Verbal Aptitude: English is Easy- Chetanand Singh, BSC Publication-2018

Reference books [RB]:

1. Quantitative Aptitude: Quantitative Aptitude for Competitive Examinations- R.S. Agarwal S. Chand Publications-2018.
   Quantitative Aptitude: Quantitative Aptitude- Saurabh Rawat and Anushree Sah Rawat Savera Publishing House, 1st edition-2016.
2. Logical Reasoning: Analytical & Logical Reasoning by Peeyush Bhardwaj-Arihant Publications; 4th edition-2015.
   Logical Reasoning: Analytical Reasoning by M.K.Pandey BSC publishing; 3rd edition . -2009.
3. Verbal Aptitude: Oxford Guide to English Grammar- John Eastwood, Oxford University Press-2003.
4. Soft Skills: Talk like Ted – Carmine Gallo, St. Martin's Press.
   Soft Skills: No Excuses – Dr Wayne Dyer, Hay House Inc.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC 301	Subject Title	PRINCIPLE OF COMMUNICATION ENGINEERING						
LTP	3 1 2	Credit	5	Subject Category	Deptt.core	Year	3rd	Semester	V

OBJECTIVE:

- To introduce the students to the basic concepts of communication systems.
- To understand and implement the basic analog communication techniques/ circuits with the help of theoretical and practical problem solving.
- To understand the basic analog communication techniques which in turn are used as the building blocks of the larger and more complex communication systems.

Unit I: Introduction to Communication:

Communication system, Analog and Digital Signals, channel bandwidth, redundancy, a periodic representation of Fourier Integral transforms of some useful signals. Signal Transmission through a Linear System , Ideal and Practical Filters, Signal Distortion over a Communication Channel ,Signal Energy and Energy Spectral Density , Signal Power and Power Spectral Density, Types of noise in Communication systems.

7L

Unit II: Amplitude Modulation

Baseband and Pass band Communication, Amplitude modulation-DSB, Amplitude Modulation (AM) Quadrature Amplitude Modulation (QAM),Amplitude Modulation: Single Sideband (SSB),Amplitude Modulation: Vestigial Sideband (VSB),Carrier Acquisition, TRF & Super heterodyne AM Receiver, Receiver characteristics, Behavior of Baseband Systems , Amplitude-Modulated Systems in presence of noise. **8L**

Unit III: Angle Modulation:

Concept of Instantaneous Frequency, Bandwidth of Angle-Modulated Wave ,Generation of FM Waves, Demodulation of FM using PLL, Costas Loop ,Interference in Angle-Modulated Systems, FM Receiver, Super heterodyne FM Receiver, Behavior of Frequency Modulated Systems in presence of noise, Optimum Pre emphasis-De emphasis System. **8L**

Unit IV: Analog Pulse Modulation:

Sampling Theorem for Low pass and Band pass signals, Aliasing, Sampling Techniques: principle, generation and detection, PAM, PWM, PPM, and Behavior of Pulse Modulated Systems in presence of noise. **7L**

Unit V: Quantization and Multiplexing:

Quantization, Quantization error, non uniform quantizing, encoding, Introduction to the concept of Pulse-Code Modulation, A Digital Communication System, Scrambling ,Regenerative Repeater, Digital Carrier Systems , Multiplexing techniques **8L**

Text Books:

1. Simon Haykins, 'Communication Systems', John Wiley,5th edition

Reference Books

1. Herbert Taub and Donald Schilling, 'Principles of Communication Systems', Tata McGraw Hill , 2nd Ed.
2. A.B. Carlson, "Communication Systems ",Tata McGraw-Hill 5th Edition
3. B.P.Lathi, 'Modern Analog and Digital Communication systems', Third edition.

LEARNING OUTCOME:

The course provides an understanding of:

- Basic working of communication system.
- Analog Modulation Techniques and their comparative analysis and applications suitability.
- Process of Modulation and Demodulation.
- Types, characterization and performance parameters of transmission channels.
- Analog to digital conversion and Digital data transmission.
- Multiplexing Techniques.

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 using FM detector.
5. To observe the effects of pre-emphasis on given input signal and to observe the effects of De-emphasis on given input signal.
6. To generate the Pulse Amplitude modulated and demodulated waves.
7. To generate Pulse Width modulated and demodulated waves.
8. To generate Pulse Position Modulated and demodulated waves.
9. To construct the frequency division multiplexing and demultiplexing circuit and to verify its operation.

List of Two Value Added Experiments:

1. To design a communication (AM/FM/PM) system for distance of 100 meters.
2. Study of SSB-SC /DSB-SC and VSB using MATLAB

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC 341	Subject Title	TRANSDUCER AND INSTRUMENTATION						
LTP	3 0 2	Credit	4.0	Subject Category	Depart. Elective	Year	3rd	Semester	V

OBJECTIVE:

- 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 I: 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 II: 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. **7L**

UNIT III: Pressure Sensors:

Types, Manometers, Bourdon Tube – C Type, spiral type, Helical Type, Bellows, Diaphragms, Pressure Measurement using: LVDT, Potentiometer, Photoelectric Transducer. **7L**

UNIT IV: 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.

7L

UNIT V: 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. **7L**

Text Books:

1. D. Patranabis, “Sensors and Transducers,” 2nd edition, Prentice Hall of India Private Limited

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).
4. Ian R. Sinclair, “ Sensors & Transducers”, 3rd Edition, Newnes Publications.
5. E.O. Doebelin and Dhanesh N Manik, “Measurement Systems,” 6th Edition, McGraw Hill Education, India

LEARNING OUTCOME:

After completion of this course the student will:

- 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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC 342	Subject Title	DIGITAL DESIGN USING VERILOG						
LTP	3 0 2	Credit	4.0	Subject Category	Depart. Elective	Year	3rd	Semester	V

OBJECTIVE:

- Designing digital circuits, behavioral and RTL modeling of digital circuits using Verilog HDL.
- Verifying these models and synthesizing RTL models to standard cell libraries and FPGAs.
- Students gain practical experience by designing, modelling, implementing and verifying several digital circuits.

UNIT I:

ASIC design flow, Introduction to verilog; Design methodologies, Language construct and lexical conventions. Data types; System task and compiler directives, modules and ports, Gate level modeling **7L**

UNIT II:

Modeling at data flow level, Continuous Assignment Statement; Delays; Operators; Verilog for combinational Circuits, Design of Adder, Subtractor, Decoders, Encoders, Multiplexer, code Converter **7L**

UNIT III:

Behavioral modeling: Structured procedures, procedural assignments, Timing Controls; Conditional statements: case, case x and case z statements; Loops: while, for, repeat, forever; Sequential and parallel blocks, force-release; Construct assign-de-assign construct; Design of Flip flop using Verilog; Design of Shift register using Verilog; Design of Counters using Verilog **8L**

UNIT IV:

Functions, Tasks;Timing and delays: delay models; Path delay modeling, timing checks; Switch level modeling: Switch-modeling elements; Switch level modeling: Examples User defined primitives: UDP, Combinational UDP; User defined primitives: Sequential UDP, UDP Table Shorthand Symbols

7LUNIT V:

State Machine: Moore state model; State Machine: Mealay state model; Verilog code for Moore-type FSM, Specification of Mealy FSM using Verilog; Mealy-type FSM for Serial Adder and Verilog code Moore-type FSM for Serial Adder and Verilog code; Programmable logic device: Introduction, Block diagram. Macrocell structures and characteristics of PLDs and CPLDs; Macrocell structures and characteristics of PLDs and CPLDs. FPGA design flow; Architecture and features of FPGAs. **8L**

Text Books:

1. Samir Palnitkar, 'Verilog HDL', Sunsoft Press.
2. Charles Roth, 'Fundamental of Logic Design', Cengage Learning.

Reference Books:

1. T.R. Padmanabhan& B. Bala Tripura Sundari, 'Design through Verilog HDL', Wiley Pub. 2007.
2. Michael John Sebastian Smith, 'Application-Specific Integrated Circuits', Addison-Wesley, 1997.
3. Stephen Brown and ZvonkoVranesic, 'Fundamentals of Digital Logic with Verilog Design', Third Edition, McGraw Hill.

LEARNING OUTCOME:

The course provides an understanding of:

- Describe Verilog hardware description languages (HDL).
- Design Digital Circuits.
- Write behavioral models of digital circuits.
- Write Register Transfer Level (RTL) models of digital circuits.

- Verify behavioral and RTL models.
- Describe standard cell libraries and FPGAs.
- Synthesize RTL models to standard cell libraries and FPGAs.
- Implement RTL models on FPGAs and Testing & Verification.

List of Experiments:

1. Simulation using all the modeling styles and Synthesis of all the logic gates using Verilog HDL.
2. Simulation using all the modeling styles and Synthesis of 1-bit half adder and 1-bitFull adder using Verilog HDL.
3. Simulation using all the modeling styles and Synthesis of 2:1 Multiplexer and 4:1Multiplexer using Verilog HDL.
4. Simulation and Synthesis of 1:4 Demultiplexer using Verilog HDL.
5. Simulation and Synthesis of 2:4 Decoder using Verilog HDL.
6. Simulation and Synthesis of 4:2 Encoder using VERILOG HDL.
7. Simulation and Synthesis of 4:2 Priority Encoder using VERILOG HDL.
8. Simulation and Synthesis of magnitude comparator 1-bit using VERILOG HDL.
9. Simulation and Synthesis of D flip flop using VERILOG HDL.
10. Simulation and Synthesis of JK, T Flip Flop using VERILOG HDL.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC 343	Subject Title	MICROWAVE & RADAR						
LTP	3 0 2	Credit	4.0	Subject Category	Depart. Elective	Year	3rd	Semester	V

OBJECTIVE:

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to Install and Maintain microwave devices, components and accessories used in telecommunication field.

UNIT I:TWO PORT RF NETWORKS-CIRCUIT REPRESENTATION

Low frequency parameters: impedance, admittance, hybrid and ABCD. Microwave frequency range, applications of microwaves, Scattering matrix- Concept of N port scattering matrix representation, Properties of S - matrix, S matrix formulation of two-port junction. **7L**

UNIT II: MICROWAVE PASSIVE COMPONENTS:

Microwave junctions: Tee junctions, Magic Tee, Rat race, Corners, bends and twists, Directional couplers: two-hole directional couplers, Ferrites, important microwave properties and applications: Gyrator, Isolator, Circulator, Attenuator, Phase changer, S Matrix for microwave components. impedance matching networks, frequency response, T and Π matching networks, microstrip line matching networks. **8L**

UNIT III: MICROWAVE TUBES AND MEASUREMENTS:

High frequency limitations, Principle of operation of Multi- cavity Klystron, Reflex Klystron, Traveling Wave Tube, and Magnetron. Microwave measurements: Measurement of power, wavelength, impedance, SWR, attenuation, Q and Phase shift. **8L**

UNIT IV: RADAR systems:

Introduction: Basic principle of RADAR and SONAR, RADAR range equation, factors affecting maximum range, MTI and Pulse RADAR: block diagram, RADAR antenna and scanning and tracking methods, Display methods.

7L

UNIT V: RADAR systems:

CW Doppler RADAR: Moving target indicator RADAR, blind speed, Frequency modulated CW RADAR, RADAR applications. Propagation of RADAR waves: plane earth and round earth concepts. **8L**

Text Books:

1. Liao Samuel, "Microwave Devices & Circuits", PHI Learning, New Delhi, (Latest edition)
2. D.M. Pozar, "Microwave Engineering.", John Wiley & sons, Inc., 2006.
3. Kennedy George "Electronics communication system",Tata McGraw hill, New Delhi (Latest edition)

Reference Books:

1.Microwave & RADAR Engineering by Gautam A. K, S K Kataria Publications, New Delhi,(Latest edition)
2 Merrill I. Skolnik, 'Introduction to radar systems', McGRAW-HILL BOOK COMPANY,(2nd edition)
3. Robert. E. Collin, 'Foundation of Microwave Engg', McGraw Hill.
4. M.M. Radmanesh , 'RF & Microwave Electronics Illustrated', Pearson Education, 2007.

LEARNING OUTCOME:

The course provides an understanding of:

- Microwave components and Set up of microwave bench for optimum operation.
- Microwave semiconductor devices used to realized amplifiers and oscillators.
- RADAR system as microwave application.

List of Experiments:

1. Gunn Diode Characteristics
2. Reflex Klystron Characteristics
3. Attenuation Measurement
4. VSWR Measurement
5. Waveguide Parameters Measurement
6. Impedance and Frequency Measurement
7. Scattering Parameters of Magic Tee
8. Directional Coupler Characteristics
9. Radiation Pattern of Horn Antenna
10. Measurement of losses for microwave Link

List of Two Value Added Experiments:

1. Measurement of losses for Analog Optical Link
2. Visit a place where waveguides are used for microwave communication. (Such as airport, earth station, Telephone exchange, Microwave link repeater, TV broadcast).

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC344	Subject Title	FILTER DESIGN						
LTP	3 0 2	Credit	4.0	Subject Category	Depart. Elective	Year	3rd	Semester	V

OBJECTIVE:

- Introduction to Active Filters
- To learn and develop the design approach of active filters
- To study the basic parameters that affects the performance of active filters
- To study higher order and universal filters.

UNIT I: Introduction to Active Filters:

Filters and Signals, Filter type, mathematics of elementary filters (Butterworth, Chebyshew , Bessel-Thomson and Elliptical Filters),Active filter applications , VCVS. **6L**

UNIT II: Sallen – Key Filters & Universal Filters:

Sallen –Key Filters (First order and Second order LPF & HPF), Multi-Feedback Filter-Low Pass and High Pass Filters, Deliyannis's Band Pass Filter,Universal Filter (State Variable Filter)-Second order Low-Pass and Second Order High – Pass Filters. **8L**

UNIT III: Sensitivity & Filters with GIC:

Magnitude and Phase Sensitivity, root sensitivity, Filter with GIC (Generalized Impedance Converter)-LPF , HPF & Narrow band – pass and band rejected. **7L**

UNIT IV: OTA Filters & Delay Filters:

Singe OTA Low –Pass Filter with passive components – First Order and Second order, OTA-C Filter, Non-ideal features of OTA, Time delay & Transfer function, Bessel-Thomson response, Design of Bessel-Thomson filter.

8L

UNIT V: Switched Capacitor Filters:

Switched Capacitor Resistors, Integrator, Universal Filters, LMF100, Low pass, high pass filters, limitations of SC – Filters. **7L**

Text Books:

1. S.A.PACTITIS, 'Active Filters -Theory and Design", CRC Press, Taylor & Francis.
2. Rolf Schaumann, Haiqiao Xiao, and Mac Van Valkenburg, 'Design of Analog Filters',Second Edition, Oxford University Press.

Reference Books:

1. M.E.Van Valkenburg, Holt Sonders, 'Analog Filter Design', International Edition (HRW Series)
2. Steve Winder, 'Analog and Digital Filter Design', Second Edition, Newnes Pub. USA.

LEARNING OUTCOME:

The course provides an understanding of:

- Active filters
- Develop the design approach for analog filtering
- Skills to design the high frequency filters.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

List of Experiments:

1. Introduction to PSPICE Simulation.
2. PSIPCE Simulation of differential amplifier.
3. PSIPCE Simulation of Op-Amp based Differentiator, Integrator.
4. PSIPCE Simulation of Op-Amp based Rectifier , clipper and clamper circuits.
5. PSIPCE Simulation of Wien- Bridge Oscillator.
6. PSIPCE Simulation of Passive filters (LPF & HPF).
7. PSIPCE Simulation of passive filters (NB – BP & BR)
8. PSIPCE Simulation of Op-Amp based square wave generator.
9. PSIPCE Simulation of Op-Amp based first order active filter (LPF & HPF).
10. PSIPCE Simulation of Op-Amp based second order active filter (LPF & HPF).

List of Two Value Added Experiments:

1. PSIPCE Simulation of Universal Gates.
2. PSIPCE Simulation of Op-Amp based second order active filter (NB-Band Pass & Band Reject).

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC345	Subject Title	VLSI DESIGN						
LTP	3 0 2	Credit	4.0	Subject Category	Depart. Elective	Year	3rd	Semester	V

OBJECTIVE:

- Introduction to basic theories and techniques of digital VLSI design in CMOS technology.
- Study of fundamental concepts and structures of designing digital VLSI systems including static and dynamic logical circuits

UNIT I: INTRODUCTION:

VLSI design methodologies, VLSI design flow, Design Hierarchy, Concepts of regularity, modularity and locality, VLSI design styles: full custom, semi- custom, FPGA, Gate array. MOS Transistor: MOS structure, MOS system under external bias, threshold voltage, V-I characteristics, derivation of drain current, channel length, substrate bias effect. **8L**

UNIT II: CMOS INVERTER:

Resistive load inverter, Enhancement/depletion load inverter (circuit diagram, advantages and disadvantages); Static CMOS inverter: Voltage transfer characteristics, calculation of VIL, VIH and VTH, noise margin concepts and their evaluation, power consumption. **7L**

UNIT III: MOS Design and Logic:

MOS Layers, stick diagrams, MOS Design style, Design rules and layout, layout diagrams; Combinational MOS logic circuit: Design of two input NOR gate and two input NAND (calculation of V_{OH} and V_{OL}), Complex logic circuits and layout. CMOS transmission Gate; Sequential MOS Logic Circuits: Introduction, Behaviour of Bistable elements, SR latch circuit, clocked SR latch, JK latch. **8L**

UNIT IV: Dynamic Logic Circuit and Memories:

Basic principles of Pass Transistor circuit. CMOS Transmission gate logic, Dynamic CMOS logic, High performance Dynamic CMOS structures: DOMINO and NORA logic; MEMORIES: Memory classification, Non-volatile memory: design of NAND and NOR based ROM; DRAM: design (1T, 2T, 3T), read and write operations and operating modes; SRAM: design and operation; Flash Memory: design, data programming and erasing techniques; **8L**

UNIT V: Design for Testability:

Fault types and models: Physical defects, Electrical Faults and Logical Faults, controllability and observability, Design for testability, Ad Hoc testing, structured design for testability, Built-In self-Test (BIST) Techniques. **7L**

Text Books:

1. Sung-Mo Kang, 'CMOS Digital Integrated Circuits', Tata McGraw Hill

Reference Books:

1. Neil H.E. Weste, 'Principle of CMOS VLSI Design', Pearson Education India
2. Jan M. Rabey, 'Digital Integrated Circuist', Prentice Hall Publication
3. A. Pucknell and Kamran Eshraghian, 'Basic VLSI Design by Douglas'

LEARNING OUTCOME:

The student will

- Be able to use mathematical methods and circuit models in analysis of CMOS digital electronics circuits.
- Be able to create models of moderately sized CMOS circuits that realize specified digital functions.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

List of Experiments:

1. Design, Simulation and analysis of all logic gates using ORCAD tools.
2. Design, Simulation and analysis of half wave, full wave and full wave bridge rectifier using ORCAD tools.
3. Design, Simulation and analysis of positive & negative clipper and positive & negative clamper circuit using ORCAD tools.
4. To implement the half-adder, half-subtractor and full-adder, full-subtractor using ORCAD tools.
5. Design, Simulation and analysis of 4:1 MUX using ORCAD tools.
6. Design, Simulation and analysis of 2-input NAND and NOR gate using ORCAD tools.
7. Design, simulation and analysis of NMOS and CMOS inverter using ORCAD tools.
8. Design, simulation and analysis of Up/Down, Mod-m Counter using ORCAD tools.
9. Design, simulation and analysis of differential amplifier using ORCAD tools.

List of Two Value Added Experiments:

1. Design, Simulation and analysis of basic current mirror using MOS transistors.
2. Design. Simulation and analysis of Static/Dynamic hazards removal circuits.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS343	Subject Title	Advanced Concepts in OOPs						
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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EE342	Subject Title	Telemetry & Data Transmission						
LTP	3 0 2	Credit	4.0	Subject Category	Depart. Elective	Year	3rd	Semester	V

OBJECTIVES:

- 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

UNIT I-:

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

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 II-:

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 III-:

Data Reception Systems: Bit synchronizers, frame synchronizers, subframe synchronizers, PLL, Display systems. **7L**

UNIT IV-:

Remote Control: Communication based processing control systems, pipelines, Operational security systems components, Pipeline control, Power system control, Programmable controllers for factory automation.

Command: Tone command system, Tone digital command system, ON/OFF command and data commands. **8L**

UNIT V-:

Aerospace Telemetry: Signal formation and conversion, Multiplexing techniques in telecontrol, Industrial telecontrol installations, reliability in telecontrol installations. **7L**

Text Books:

1. Patranabis," Telemetry Principles: Tata Mcgrew Hill.

Reference books:

1. Berder & Menjewlse," Telemetry Systems".
2. Schweber," Data Communication " Mcgraw Hill.

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EE343	Subject Title	DYNAMIC SYSTEM ANALYSIS						
LTP	3 1 0	Credit	4.0	Subject Category	Depart. Elective	Year	3rd	Semester	V

OBJECTIVES:

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

UNIT I-:

Control Concepts and Mathematical Modeling 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 II-:

System Representation and Control Components 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 III-:

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 IV-:

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 V-:

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.

7L

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EE344	Subject Title	UTILIZATION OF ELECTRICAL ENERGY & TRACTION						
LTP	3 1 0	Credit	4.0	Subject Category	Depart. Elective	Year	3rd	Semester	V

OBJECTIVES:

- 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 I-:

Electric Heating: Advantage & methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating. **8L**

UNIT II-:

Electric Welding: Electric arc welding, electric resistance welding, Electric Welding control,
Electrolyte Process: Principal of Electro deposition, laws of Electrolysis, application Electrolysis.
8L

UNIT III-:

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 IV-:

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 V-:

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.
7L

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EE346	Subject Title	WIND AND SOLAR ENERGY SYSTEMS						
LTP	3 0 2	Credit	4.0	Subject Category	Depart. Elective	Year	3rd	Semester	V

OBJECTIVES:

- Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.
- Understand the basic physics of wind and solar power generation.
- Understand the power electronic interfaces for wind and solar generation.
- Understand the issues related to the grid-integration of solar and wind energy systems.

UNIT I-:

Physics of Wind Power: History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions. **5L**

UNIT II-:

Wind generator topologies: Review of modern wind turbine technologies,Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent- Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control. **12L**

UNIT III-:

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

Solar photovoltaic: Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control. **11L**

UNIT IV-:

Network Integration Issues: Overview of grid code technical requirements. Fault ride-through for wind farms- real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems. **8L**

UNIT V-:

Solar thermal power generation: Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis. **3L**

Text Book:

1. T. Ackermann, "Wind Power in Power Systems", John Wiley and Sons Ltd., 2005.

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.
3. G. M. Masters, "Renewable and Efficient Electric Power Systems", John Wiley and Sons, 2004.
4. S. P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", McGraw Hill, 1984.
5. H. Siegfried and R. Waddington, "Grid integration of wind energy conversion systems" John Wiley and Sons Ltd., 2006.

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 sources

List of Experiments

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EE347	Subject Title	HIGH VOLTAGE ENGINEERING						
LTP	3 1 0	Credit	4.0	Subject Category	Depart. Elective	Year	3rd	Semester	V

OBJECTIVES:

- 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

UNIT I-:

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.

Break Down In Liquid Dielectrics Classification of liquid dielectric, characteristics of liquid dielectric, breakdown in pure liquid and commercial liquid.

Break Down In Solid Dielectric Intrinsic breakdown, electromechanical breakdown, breakdown of solid, dielectric in practice, breakdown in composite dielectrics. **8L**

UNIT II-:

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 III-:

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 IV-:

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. **7L**

UNIT V-:

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

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.1991.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Outcome of the Course:

- To analyze 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 equipment's.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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]:

5. Quantitative Ability:How to prepare for Quantitative Aptitude, Arun Sharma, McGraw Hill, 8th edition-2018.
6. Logical Reasoning**:** A Modern Approach to Logical Reasoning-R.S. Aggarwal S Chand Publishing; 2nd Colour edition-2018.
7. Verbal Aptitude: English is Easy- Chetanand Singh, BSC Publication-2018.
8. 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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC305	Subject Title	DIGITAL COMMUNICATION						
LTP	3 0 3	Credit	4.5	Subject Category	Deptt.core	Year	3rd	Semester	VI

OBJECTIVES:

- To understand the building blocks of digital communication system.
- To prepare mathematical background for communication signal analysis
- To understand the Digital communication techniques which in turn are used as the building blocks of the larger and more complex communication systems.
- To understand concept of spread spectrum communication system.

UNIT I: Elements Of Digital Communication And Information Theory

Model of a Digital Communication, System, Probability Theory, Entropy and Information Rate, Conditional Entropy and Redundancy, Source Coding, Fixed and Variable Length Code Words, Source Coding Theorem, Prefix free code and, Kraft Inequality, Shannon-Fano and Huffman Coding. **8L**

UNIT II: Digital Base Band Transmission

PCM Coding, DM, DPCM, ADCM, Data Transfer Rate, Line Coding and Its Properties, NRZ & RZ Types, Signalling Format For Unipolar, Polar, Bipolar(AMI) & Manchester Coding, Matched Filter Receiver, Derivation of Its Impulse Response and Peak Pulse Signal to noise ratio, ISI, Rectangular, sync & Raised cosine pulse comparison **8L**

Unit III: Digital Modulation Techniques:

Gram-Schmidt Orthogonalization Procedure, Types of Digital Modulation, correlation receiver, Waveforms for Amplitude, Frequency and Phase Shift Keying, Method of Generation and Detection of Coherent & Non-Coherent Binary ASK, FSK & PSK & PSD derivation for Coherent & Non- Coherent Binary ASK, FSK & PSK. Differential Phase Shift Keying, bit error rate comparison of Digital modulation techniques. **8L**

UNIT IV: Advanced Modulation Techniques:

Introduction to M-ary modulation techniquesQPSK, QAM, MSK, GMSK. Spread spectrum-Introduction,Direct sequence spread spectrum, processing gain, Frequency hop Spread spectrum-Slow and fast FHSS. **7L**

UNIT V: Error Control Coding:

Error Free Communication Over a Noise Channel, Hamming code, Relation Between Minimum Distance and Minimum Distance Error Correcting & detection Capability, Linear Block Codes, Encoding and Syndrome Decoding, Cyclic Codes, , Encoder and Decoder For Cyclic Codes, Convolution Coding & Viterbi decoding.

8L

Text Books:

1. Simon Haykins, 'Communication Systems', John Wiley,5th edition
2. Singh, R .P. & Sapre, "Communication Systems : Analog & Digital" , TMH 3rd Edition

Reference Books:

1. Herbert Taub and Donald Schilling, "Principles of Communication Systems", Tata McGrawHill , 2nd Ed.
2. A.B . Carlson ,"Communication Systems ",Tata McGraw-Hill Latest Edition
3. B.P.Lathi, "Modern Analog and Digital Communication systems", Third edition.

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- Compression of data based on probability.

- Digital Modulation Techniques and their comparative analysis and applications suitability.
- Error Detection and correction mechanism of Digital data.

List of Experiments:

1. To study sampling and reconstruction of the sampled signal.
2. To study Delta Modulation and Demodulation.
3. To study Adaptive Delta Modulation and Demodulation.
4. To study ASK modulation and Demodulation.
5. To study FSK modulation and Demodulation.
6. To study PSK modulation and Demodulation.
7. To Study TDM/PCM Transmitter /Receiver.
8. To Study different Line Coding Techniques.
9. To Study DHSS, FHSS.

List of Two Value Added Experiments:

1. QPSK modulation and demodulation simulation using MATLAB.
2. MSK modulation and demodulation simulation using MATLAB.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC 306	Subject Title	MICROPROCESSOR 8086						
LTP	3 0 2	Credit	4	Subject Category	Deptt.core	Year	3rd	Semester	VI

OBJECTIVE:

This course will enable students to:

1. Understand architecture of 8086 microprocessor
2. Program 8086 Microprocessor using Assembly Level Language
3. Understand interfacing of 16 bit microprocessor with memory and peripheral chips involving system design

Unit-I: Introduction to 8068 Microprocessor

8086 PROCESSOR: Historical background, Registerorganization, Address,DataandControlBuses,PinFunctions, De-multiplexingofBuses,Generation ofControlSignals,Timingdiagrams:InstructionCycle,MachineCycles,T-States,ConceptofAddresslineandMemoryinterfacing,Address DecodingandMemoryInterfacing. 8086 pin diagram, 8086 Internal Architecture. **8L**

Unit-II: Programming the 8086 Microprocessor - 1

Addressing modes, Machine language instruction formats, Machine coding the program, INSTRUCTION SET OF 8086: Data transfer and arithmetic instructions. Control/Branch Instructions, Illustration of these instructions with example programs, Logical Instructions, String manipulation instructions, Flag manipulation and Processor control instructions, Illustration of these instructions with example programs. Assembler Directives and Operators, Assembly Language Programming and example programs **8L**

Unit-III: Programming the 8086 Microprocessor – 2

Stack and Interrupts: Introduction to stack, Stack structure of 8086, Programming for Stack. Interrupts and Interrupt Service routines, Interrupt cycle of 8086, NMI, INTR, Interrupt programming, Passing parameters to procedures, Macros, Timing and Delays. **8L**

Unit-IV: Interfacing with 8086 Microprocessor – 1

8086 Bus Configuration and Timings: Physical memory Organization, General Bus operation cycle, I/O addressing capability, Special processor activities, Minimum mode 8086 system and Timing diagrams, Maximum Mode 8086 system and Timing diagrams. Interfacing I/O ports, PPI 8255, Modes of operation of a 8255, Interfacing Keyboard and 7-Segment digits using 8255**.** **7L**

Unit-V: Interfacing with 8086 Microprocessor – 2

Interfacing Timer 8254, Modes of operation of 8254, Interfacing ADC-0808/0809, DAC-0800, Interfacing PIC 8259, Interfacing 8237 DMA Controller. **7L**

Text Book:

1. Microprocessor and Interfacing - Douglas V Hall, SSSP Rao, 3rd edition TMH, 2012.
2. The 8086 Microprocessor: Programming & Interfacing the PC – Kenneth J Ayala, CENGAGE Learning, 2011.
3. The Intel Microprocessor, Architecture, Programming and Interfacing - Barry B. Brey, 6e, Pearson Education / PHI, 2003.

Reference Books:

1. Advanced Microprocessors and Peripherals - A.K. Ray and K.M. Bhurchandi, TMH, 3rd Edition, 2012, ISBN 978-1-25-900613-5.
2. Microcomputer systems-The 8086 / 8088 Family – Y.C. Liu and A. Gibson, 2nd edition, PHI -2003.

LEARNING OUTCOME:

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

1. Explain the History of evaluation of Microprocessors,
2. Explain and work with the Architecture of 8086,
3. Write 8086 Assembly level programs using the 8086 instruction set
4. Write modular programs using procedures and macros. Write 8086 Stack and Interrupts programming Interface 8086 to Static memory chips and 8255, 8254, 0808 ADC, 0800 DAC, 8259, 8237
5. ing Interface 8086 to Static memory chips and 8255, 8254, 0808 ADC, 0800 DAC, 8259, 8237

List of Experiments:

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions I - Addition/subtraction.
3. Arithmetic Instructions II - multiplication and division.
4. Boolean & Logical Instructions (Bit manipulations).
5. Code conversion: BCD – ASCII; ASCII – Decimal;
6. Generation of Fibonacci Series.

II. INTERFACING

Write Assembly programs to interface 8051 chip to Interfacing modules.

1. Interfacing the 8255 PPI (e.g. Interfacing 4x4 matrix keyboard)
2. Interfacing the 8254 Timer (e.g. generate clock signals)
3. Interfacing 7-Segment LED Display with 8086 microprocessor.
4. Stepper motor control with 8086 microprocessor.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC351	Subject Title	DATA COMMUNICATION NETWORK						
LTP	3 1 0	Credit	4	Subject Category	Dept. Elec.	Year	3rd	Semester	VI

OBJECTIVES:

- To understand the concept of Computer Communication.
- To learn the basics of Data communication and Networks
- To understand the concept of protocols and security of data communication network.
- To develop and design the protocol systems for advance computer communication.

UNIT I: Introduction to Data Communication Network & Physical Layer:

Switching systems, network hardware and software, Layering, design issues for layering, reference models and their comparison, example of networks. Physical Layer: Transmission media and channel impairments, modulation, multiplexing, digital channels, switching. **8L**

UNIT II: Data Link Layer:

Design issues, framing, error control, elementary data link protocols and sliding window protocols, HDLC, data link layer in internet. Medium Access Control : Channel allocation problem, MAC protocols- Aloha, CSMA, collision free protocols, limited contention protocol, Ethernet, IEEE 802.3 standard, Repeaters, bridges, routers and gateways. **8L**

UNIT III: Network Layer

Design issues, VC and datagram subnets, routing algorithms for wired and wireless hosts, congestion prevention policies, load shedding. Connectivity of networks, connectionless internetworking, internetwork routing, fragmentation, IP protocols, IP addressing, OSPF, IPv6. **8L**

UNIT IV: Transport Layer

Transport service and primitives, Addressing, connation establishment and release, flow control, buffering, multiplexing and crash recovery. Introduction to UDP. Modeling TCP connection management, TCP congestion control, Performance issues. **8L**

UNIT V: Higher Layers

DNS name space and DNS server, overview of www, http. Introduction of cryptography, substitution cipher and transposition cipher, DES, cipher methods, public key algorithms. Social issues - privacy, freedom of speech, copy right. **7L**

Text Books:

1. Forouzan, B.A., “Data Communication and Networking”, 4th Ed., Tata McGraw-Hill.

Reference Books:

1. Kurose, J.F. and Ross, K.W., "Computer Networking: A Top-Down Approach Featuring the Internet", 3rd Ed., Addison Wesley.
2. Tanenbaum, A.S, “Computer Networks”, 4th Ed., Pearson Education.
3. Stallings W., “Data and Computer Communication”, 8th Ed., Prentice-Hall.

Amended by the BoS and approved by the Academic Council at its 9th Meeting held on 14.04.2018

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- Computer Communication and networks.
- Protocol design and their design issues.
- Network security and Cryptography.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

OBJECTIVES:

- 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 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, EMG, EEG. 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. Thermo resistive transducer, Inductive Transducers, Capacitive Transducer Piezoelectric Transducer Bio potential Measurement. **8L**

UNIT IV: 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 V: 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. **7L**

Text Books:

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

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

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

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC354	Subject Title	FUNDAMENTALS OF ANALOG CMOS IC DESIGN						
LTP	3 0 0	Credit	3	Subject Category	Dept. Elec.	Year	3rd	Semester	VI

OBJECTIVES:

- To understand the working of MOSFET as amplifier
- To understand and design basic CMOS analog functional blocks

UNIT I:

MOSFET: Device Structure, Threshold Voltage, C-V characteristics, I-V characteristics, device models, NMOS vs PMOS devices, long channel vs short channel devices. **6L**

UNIT II:

Single stage Amplifiers: Common source, degenerate common source, source follower, common gate, cascode and folded cascode amplifiers. Differential amplifier: Analysis, common mode response, Gilbert cell. **8L**

UNIT III:

Current Mirrors: Basic current mirror, cascode current mirror, active current mirror. Operational amplifiers: one stage and two stage op-amps, common mode feedback, input range limitation, slew rate, power supply rejection. **8L**

UNIT IV:

Feedback in amplifiers: feedback topologies, effect of loading. Band Gap References: Supply independent and temperature independent biasing, CTAT and PTAT voltage references, band gap voltage reference. **6L**

UNIT V:

Comparators: Types of comparators, open loop, regenerative and charge balancing comparators, two stage comparator.Noise: noise sources, noise modeling of amplifier circuits. **8L**

Text Books:

1. Razavi B. , “Design of Analog CMOS Integrated Circuits”, McGraw – Hill (2001)

Reference Books:

1. Paul and Gray, “Analysis and Design of Analog Integrated Circuits”, Fifth edition, John - Willey (2009)
2. Allen and Hollberg, “Analog CMOS Circuit Design”, Oxford University Press (2016)

OUTCOMES OF THE COURSE:

The course provides an understanding of:

1. MOSFET as active device
2. CMOS amolifiers, comparators
3. Band gap references

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC355	Subject Title	ADVANCED ANTENNAS						
LTP	3 0 2	Credit	4	Subject Category	Dept. Elec.	Year	3rd	Semester	VI

OBJECTIVES:

- The objective of this course is to provide an in-depth understanding of modern antenna concepts, and practical antenna design for various applications. The course will explain the theory of different types of antennas used in communication systems.
- Starting from the basic antenna parameters, the course will discuss various types of antennas including the planar printed antennas. An in-depth study will be made for the analysis and design of different types on antennas currently being used in wireless and satellite communication.

UNIT I: Introduction- Antenna and its parameter:
Fundamental Concepts: Physical concept of radiation, Radiation pattern, near- and far-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions. **8L**

UNIT II: Radiation From Wires , Loops And Aperture Antenna:
Small circular loop, Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral. Broadband Antennas:Broadband concept, Log-periodic antennas, frequency independent antennas. **8L**

UNIT III: Microstrip Antennas and Array:
Basic characteristics of microstrip antennas, feeding methods, design of rectangular and circular patch antennas, Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays, MS Arrays, Antenna for mobile communication & personal wireless communication. **8L**

UNIT IV: Introduction to Satellite Communications Antenna:
Contoured Beam Antennas¬ Multiple Beam Antennas¬ Multi-Band Antennas¬ Reconfigurable Beam Antennas¬ Hybrid Antennas¬ PIM, Multipaction, Test Methods. **8L**

UNIT V: Basic Concepts of Modern Antennas:
Concept and benefits of smart antennas, Fixed weight beamforming basics, Adaptive beamforming, Conformal Antenna, SIW Antenna. **6L**

Text Books:

1. C. A. Balanis,"Antenna Theory and Design", 3 rd Ed., John Wiley & Sons., 2005.

Reference Books:

1. Constantine A. Balanis "Modern Antenna Handbook", 780470036341 |Online ISBN:9780470294154 |DOI:10.1002/9780470294154,Copyright © 2008 John Wiley & Sons, Inc.
2. Thomas A. Milligan "Modern Antenna Design" (Wiley – IEEE) , 2nd edition, Hardcover – 29 Jul 2015
3. 3.W. L. Stutzman, and G.A. Thiele, "Antenna Theory and Design", 2 nd Ed., John Wiley & Sons., 1998.
4. 4.R. S. Elliot, "Antenna Theory and Design", Revised edition, Wiley-IEEE Press., 2003.

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- Fundamental concepts, Basic antenna parameters, Radiation from wires and loops, Aperture and Reflector Antennas, Broadband Antennas, Micro strip Antennas, Antenna Arrays
- Basic Concept of Smart Antennas.
- A brief introduction of smart antenna concept will be given at the end with a view that the student can further explore the topic, if interested.

LIST OF EXPERIMENTS

1. Design and simulation of rectangular patch antenna using micro strip feed line.
2. Design and simulation of rectangular patch antenna using probe feed.
3. Design and simulation of circular patch antenna using micro strip feed line.
4. Design and simulation of circular patch antenna using coaxial feed.
5. Design and simulation of antenna arrays using patch antennas.
6. Design and simulation of any conformal antenna.
7. Design and simulation of leaky wave antenna.
8. Design and simulation of monopole antenna.

Two Value Added Experiments to be included by Instructor

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC356	Subject Title	VLSI Fabrication Technology						
LTP	3 0 0	Credit	3	Subject Category	Dept. Elec.	Year	3rd	Semester	VI

OBJECTIVES:

- To understand the unit processes which comprise fabrication process of silicon integrated circuits.
- To understand basic process sequence of various transistors and IC

UNIT I:

Crystal Growth: MGS, EGS, Czochralski crystal Puller, Silicon shaping, Wafer Preparation.
Epitaxy: Vapor phase epitaxy, liquid phase epitaxy. **8L**

UNIT II:

Oxidation: Thermal oxidation, dry and wet oxidation, plasma oxidation
Lithography: Photo lithography, electron beam lithography and X-ray lithography
Diffusion: Fick's laws, diffusion mechanisms, Constant source and limited source diffusion **10L**

UNIT III:

Ion Implantation, Reactive Plasma Etching, Di-electric and Poly-Silicon Film Deposition **8L**

UNIT IV:

Metallization: Thermal evaporation, electron beam evaporation, Sputtering, Metallization Failure mechanism Isolation Techniques **8L**

UNIT V:

Assembly & Packaging: Die bonding, wire bonding, packaging
IC fabrication Process Sequence: Process sequence for BJT, NMOS,CMOS ICs **6L**

Text Books:

1. S.M.Sze, VLSI Technology, Mc Graw Hill.
2. S.K.Ghandhi, VLSI Fabrication Principles.

Reference Books:

1. Pucknell DA &Eshraghian K, Basic VLSI Design, PHI

OUTCOMES OF THE COURSE:

The course provides an understanding of:

1. Basic processes which are required for IC fabrication
2. Process sequences for ICs
3. Problems involved in micro fabrication

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS303	Subject Title	COMPUTER GRAPHICS						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	3rd	Semester	VI

OBJECTIVES:

This course is designed to provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.

1. A thorough introduction to computer graphics techniques, focusing on 3D modelling, image synthesis, and rendering. We will look at raster scan graphics including line and circle drawing, polygon filling, anti-aliasing algorithms, clipping, hidden-line and hidden surface.
2. The interdisciplinary nature of computer graphics is emphasized in the wide variety of examples and applications.

Unit I : (7 L)

Introduction to computer graphics and primitives algorithms: Points, planes, pixels and frames buffers, lines, circles and ellipse drawing algorithms, display devices, primitive devices, applications of computer graphics.

Unit II : (7 L)

Two-Dimensional Transformation: Introduction to transformation matrix, **Types of transformations in 2-D:** Identity Transformation, Scaling, Reflection, Shear Transformation, Rotation, Translation, Rotation about an arbitrary point, Combined Transformation, Homogeneous coordinates, 2-D transformation using homogeneous coordinates.

Unit III : (8 L)

Three-Dimensional Transformation: Objects in homogeneous coordinates, **3-D Transformation:** Scaling, Translation, Rotation, Shear Transformations, Reflection, world coordinates and viewing coordinates, Projection, parallel Projection, Perspective projection. **Hidden Lines and Surfaces:** Back face removal algorithms, Hidden lines methods.

Unit IV : (8 L)

Viewing and Solid Area Scan-Conversion: Introduction to viewing and clipping, viewing transformation in 2-D, Point Clipping, Line Clipping, Introduction to polygon Clipping, Viewing and clipping in 3-D, Three Dimensional Viewing Transformations, Text Clipping, generalize Clipping, Multiple windowing.

Introduction to Solid Area Scan: Conversion, Inside-Outside Test, Winding Number Method and Coherence Property, Polygon Filling, Seed Fill Algorithms, Scan Line Algorithm, priority Algorithm, Scan Conversion of Characters, Aliasing, Anti-aliasing, Halfoning, Threshold and Dithering

Unit V : (6 L)

Introduction to curves: Curves Continuity, Conic Curves, Piecewise Curve Design, Spline curve representation, Bezier Curves, Fractals and its Applications.

Object rendering: Introduction to Object Rendering, Shading, Ray Tracing, Illuminational model, Colour Models.

LEARNING OUTCOMES

After completion of the course the students will able to learn:

CO1. To understand a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.

CO2. Explain the through introduction to computer graphics techniques, focusing on 2D and 3D modeling, image synthesis, and rendering.

CO3. Expose to the interdisciplinary nature of computer graphics is emphasized in the wide variety of examples and applications

CO4. Students will be able to develop the projects based on Computer Graphics.

Text Book:

1. R.K. Maurya, Computer Graphics, John Willey.2011
2. David F. Rogers, Procedural Elements of Computer Graphics, Tata McGraw Hill.1985

Reference Book:

1. Donald Hearn and M.Pauline Beaker, Computer Graphics, Prentice Hall of India, 2010.
2. Steven Harrington, Computer Graphics, McGraw Hill.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	IT345	Subject Title	R -programming						
LTP	3 0 2	Credit	4	Subject Category	DE	Year	3rd	Semester	VI

Course Objective:

The objective of the course is to make the students to understand basic R programming for Data analysis.

Detailed Syllabus

UNIT 1

Basic fundamentals: Installation and use of software, data editing, use of R as a calculator, functions and assignments, matrix operations, missing data and logical operators. **(6 L)**

UNIT 2

Basic calculations: Conditional executions and loops, data management with sequences, Data management with repeats, sorting, ordering, lists. **(8 L)**

UNIT 3

Data management: Vector indexing, factors, Data management with strings, display and formatting, Data management with display paste, split, find and replacement, manipulations with alphabets, evaluation of strings, data frames.

(7 L)

UNIT 4

Data compilation: Data frames, import of external data in various file formats, statistical functions, compilation of data.

(10 L)

UNIT 5

Data visualization: Graphics and plots, statistical functions for central tendency, variation, skewness and kurtosis, handling of bivarite data through graphics, correlations, programming and illustration with examples.

(9 L)

Learning Outcome

At the end of the course The student will have the knowledge of:

- Student can analyses the data based on different statistical technics
- Student can visualize the data using different plots

Text book [TB]:

1.) Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016

2.) The R Software-Fundamentals of Programming and Statistical Analysis -Pierre Lafaye de Micheaux, my Drouilhet, Benoit Liquet, Springer 2013

Reference books [RB]:

1. A Beginners Guide to R (Use R) By Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, Springer 2009

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

List of Practical

SR.NO.	EXPERIMENT NAME
1	Loading the data in R.
2	Packages in R
3	Manipulating the data
4	Handling the missing data in R
5	Normalization in R
6	statistical functions in R
7	Plots in R

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

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)

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

List Of Practicals

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS348	Subject Title	Advanced Computer Network *(Departmental Elective 3/4)*						
LTP	3 0 2	**Credit**	4	**Subject Category**	DE	**Year**	3rd	**Semester**	VI

OBJECTIVES:

This course aims to provide the understanding of the algorithms for Routing, Forwarding, Lookup, Resource management in packet switching networks and understand the Internet architecture and router internals.

Unit I **(7 L)**

Network Layer design Issues, IPv4, IPv6, Shortest Path Routing, Distance Vector Routing, Flooding, Hierarchical Routing, Broadcast Routing, Multicast Routing.

Unit II **(7 L)**

Wireless Networks, GSM Architecture, CDMA, Mobility in networks, Handoffs. Mobile IP- IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation.

Unit III **(8 L)**

Mobile TCP- Traditional TCP (Congestion Control, Slow Start, Fast Retransmit/Fast Recovery), Indirect TCP, Snooping TCP, Mobile TCP, Selective Retransmission, Transaction Oriented TCP.

Unit IV **(7 L)**

Wireless LAN- Infrared Vs Radio Transmission, Infrastructure and Ad-hoc Network, IEEE 802.11-System Architecture, Protocol Architecture, Physical Layer, Bluetooth.

Unit V **(8 L)**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management, SSL.

LEARNING OUTCOMES

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

CO1. Ability to identify the essential components of networking

CO2. Ability to analyze the algorithms for routing, forwarding, lookup with respect to stability, robustness, scalability, security

CO 3. Ability to analyze the performance of congestion control and resource management techniques

CO4. Ability to carry out further research in recent networking architectures

Text Book:

1. Jochen Schiller" Mobile, "Communications", 2nd Edition, 2008.

2. Andrew S. Tanenbaum , "Computer Networks," Pearson Education, 5th Edition, 2013.

Reference Book:

1. Forouzan, B.A., Data communication and Networking, McGraw Hill, 4th edition, 2006.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS361	Subject Title	PATTERN RECOGNITION IN AI						
LTP	3 0 2	Credit	4	Subject Category	Dept. Elec.	Year	3rd	Semester	VI

Course Objective:

This course aims to provide the knowledge to undergraduate students about the pattern recognition & its application in various area using AI.

Unit 1 (6 L)

Introduction to Pattern Recognition, Decision Trees: CART, C4.5, ID3, CHAID, Bayesian Decision Theory, Linear Discriminants Classifiers, Decision Boundary, Separability, Single and Multilayer perceptron, training set and test sets, standardization and normalization

Unit 2 (8 L)

Feature selection, Problem statement and Uses, Probabilistic separability based criterion functions, interclass distance based criterion functions, Branch and bound algorithm, sequential forward/backward selection algorithms, MRMR, FCBF, ReliefF, SVM-RFE

Unit 3 (8 L)

Unsupervised Methods Exploring the Data for Latent Structure, Component Analysis and Dimension Reduction, The Curse of Dimensionality, Principal Component Analysis, Kernel PCA, Fisher Linear Discriminant, Locally Linear Embedding, Clustering, Expectation Maximization, Single linkage and complete linkage clustering, MST, Medoids, DBSCAN, Visualization of datasets, existence of unique clusters or no clusters.

Unit 4 (8 L)

Optimization Techniques, Genetic Algorithms, Ant Colony Optimization,Particle Swarm Optimization, Cuckoo Search, Bee colony optimization, Classifier Ensembles,Selection of Classifiers, Bagging, Boosting , AdaBoost, , Random Forests, Rotation Forest.

Unit 5 (8 L)

Performance evaluation of classifier, k- fold cross validation, Jacknife and Bootstrap Methods, No Free Lunch Theorem, Ugly Duckling Theorem, Bias-Variance Dilemma, Syntactic Methods, Neural Networks, Deep learning

Course Outcome:

At the end of this course the student will able to learn about:

CO1. Concepts about pattern recognition.
CO2. Various optimization techniques
CO3. Knowledge about Deep learning
CO4. Performance evaluation of classifiers.

Text Book

1. Duda, R.O., Hart, P.E., and Stork, D.G. Pattern Classification. Wiley-Interscience. 2nd Edition. 2001.
2. Bishop, C. M. Pattern Recognition and Machine Learning. Springer. 2007.

Reference Book

1. Marsland, S. Machine Learning: An Algorithmic Perspective. CRC Press. 2009. (Also uses Python.)
2. Theodoridis, S. and Koutroumbas, K. Pattern Recognition. Edition 4. Academic Press, 2008.
3. Hastie, T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning. Springer. 2001.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	IT359	Subject Title	Mobile Computing and Services						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	3rd	Semester	VI

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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().

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS351	**Subject Title**	**SOFTWARE ENGINEERING** *(Departmental Elective 5)*						
LTP	3 0 0	**Credit**	3	**Subject Category**	DE/OE	**Year**	3rd	**Semester**	VI

OBJECTIVES:
The objective of this Course is to provide the knowledge & necessary skills to develop software.

Unit I (7L)
Introduction to Software Engineering, Software Characteristics, Software Crisis, Software Engineering Processes, Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models

Unit II (7L)
Software Requirement Analysis and Specifications: Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Data Flow Diagrams, Data Dictionaries, Entity-Relationship diagrams, Software Requirement and Specifications, Functional and non-Functional requirements, Software Prototyping, Feasibility Study, Information Modeling, Decision Tables, SRS Document, IEEE Standards for SRS, Software Quality Assurance (SQA),SEI-CMM Model.

Unit III: (8 L)
Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead‟s Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit IV : (8 L)
Software Reliability: Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Calender time Component, Reliability Allocation. **Coding:** Top-Down and Bottom –Up programming, structured programming, Compliance with Design and Coding Standards.

Unit V : (6 L)
Testing: Objectives, Testing Tools & Standards. Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Path Testing, Structural Testing (White Box Testing), Functional Testing (Black Box Testing),
Maintenance: Corrective and Perfective Maintenance, Maintenance Process, Maintenance Models, Maintenance Cost, Software Re-Engineering, Reverse Engineering. Constructive Cost Models (COCOMO).
Software Quality Management: Software Quality Factors, Quality Assurance, Quality Standards, Software Maintenance.

LEARNING OUTCOMES
At the end of the course the students will able to learn
Co1. Ability to analyze and specify software requirements
CO2. Ability to apply software engineering principles and techniques to develop large-scale software systems.
CO3. Ability to plan and work effectively in a team.

Text Book:
1.R. S. Pressman, “Software Engineering – A practitioner’s approach”, 3rd ed., McGraw Hill Int. Ed., 1992.
2. K.K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International, 2001

3. Pankaj Jalote, Software Engineering, Wiley India,2010

Reference Book:

1. Rajib Mall, Fundamentals of Software Engineering, PHI Publication, 3rd Edition, 2009.
2. Ian Sommerville, Software Engineering, Addison Wesley, 8th Edition,2011
3. James Peter, W Pedrycz, “Software Engineering”, John Wiley & Sons,2000

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS214	Subject Title	Operating Systems						
LTP	3 1 0	Credit	4	Subject Category	DC	Year	3rd	Semester	VI

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

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

OBJECTIVES:

- 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 I: 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 II: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. **7L**

UNIT III: 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 IV: 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 V: 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.

OUTCOMES 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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

OBJECTIVES:

- 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 I:

Introduction Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits, present energy scenario. **8L**

UNIT II:

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 III:

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 IV:

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. **8L**

UNIT V:

Bio-mass - Availability of bio-mass and its conversion theory.

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”.

OUTCOMES 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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

OBJECTIVES:

- 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 I:

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 II:

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 III:

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 IV:

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 V:

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.

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
4. P.C. Sen “Principles of Electrical Machines and Power Electronics” John willey & Sons, 2001

OUTCOMES 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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

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

Ellis Horowitz, Satraj Sahni and Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publications pvt. Ltd.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC401	Subject Title	Wireless Communication						
LTP	3 1 0	Credit	4.0	Subject Category	Deptt.core	Year	4th	Semester	VII

OBJECTIVE:

- To provide an overview of Wireless Communication networks area and its applications in communication engineering.
- To signify the contribution of Wireless Communication networks to overall technological growth.
- To understand the various terminologies, principles, schemes, concepts and different methodologies used in Wireless Communication Networks.

UNIT I: SERVICES AND TECHNICAL CHALLENGES:

Types of Services, Requirements for the services, Multipath propagation, Spectrum Limitations, Noise and Interference limited systems, Principles of Cellular networks, Review of 2G, 3G cellular systems, Introduction to OFDM system and evolution of 4G. **8L**

UNIT II: WIRELESS PROPAGATION CHANNELS:

Propagation Mechanisms, Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models, Fading effects- Small scale and Large scale fading, Path loss components.

7L

UNIT III: WIRELESS TRANSCEIVERS:

Structure of a wireless communication link, Modulation and demodulation – Quadrature/4-Differential Quadrature Phase Shift Keying, Offset-Quadrature Phase Shift Keying, Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power spectrum and Error performance in fading channels **8L**

UNIT IV: SIGNAL PROCESSING IN WIRELESS SYSTEMS:

Principle of Diversity, Macro-diversity, Micro-diversity, Signal Combining Techniques, Transmit diversity, Rake Receiver, Equalizers- Linear and Decision Feedback equalizers, Review of Channel coding and Speech coding techniques. **8L**

UNIT V: MULTIPLE ACCESS SCHEMES:

FDMA- Pre assigned FDMA, Demand-Assigned FDMA, TDMA-Reference Burst; Traffic Date, Frame Efficiency and Channel capacity, Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access **8L**

Text Books:

1.Rappaport. T.S., “Wireless communications”, Pearson Education, 2003
2. Andreas.F. Molisch, “Wireless Communications”, John Wiley – India, 2006

Reference Books:

1. Gordon L. Stuber, “Principles of Mobile Communication”, Springer International Ltd.,2001.
2. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.

LEARNING OUTCOME:

The course provides an understanding of:

- Basics of Wireless Communication system and technical challenges
- Propagation mechanisms and fading effects
- Wireless transceivers and Multiple access schemes

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS342	Subject Title	LINUX ADMINISTRATION AND SHELL PROGRAMMING *(Departmental Elective 1 /2)*						
LTP	3 0 2	**Credit**	4	**Subject Category**	DE	**Year**	3rd	**Semester**	V

OBJECTIVES: This course is designed to get the exposure to the students about the functioning and shell programming in Linux operating system.

UNIT I 8L

Introduction to Linux and UNIX, What is an operating system?, A brief history of UNIX, Architecture of the Linux operating system, Logging into (and out of) UNIX systems, Changing your password, General format of UNIX commands. The UNIX filesystem, Typical UNIX directory structure ,Directory and file handling commands, Making hard and soft (symbolic) links, Specifying multiple filenames, Quotes.

UNIT II 8L

File and directory permissions ,Inspecting file content ,Finding files, Finding text in files, Sortingfiles, File compression and backup, Handling removable media, Processes, Pipes, Redirecting input and output, Controlling processes associated with the current shell ,Controlling other processes

UNIT III 7L

Connecting to remote machines, Network routing utilities, Remote file transfer, Other Internet related utilities, User Information and Communication, Printer control, Email utilities. Server Configuration in Linux environment: Telnet, FTP.

UNIT IV 7L

Introduction to vi, Basic text input and navigation in vi ,Moving and copying text in vi,Searching for and replacing text in vi,Other useful vi commands, Quick reference for vi ,Introduction to emacs, Basic text input and navigation in emacs, Moving and copying text in emacs, Searching for and replacing text in emacs, Other useful emacs commands ,Other UNIX editors. The superuserroot, Shutdown and system startup, Adding users, Controlling user groups, Reconfiguring and recompiling the Linux kernel ,Cronjobs, Keeping essential system processes alive.

UNIT V 8L

Unix Shell programming: Types of Shells, Shell Metacharacters, Shell variables, Shell scripts, Shell commands, the environment, Integer arithmetic and string Manipulation, Special command line characters, Decision making and Loop control, controlling terminal input, trapping signals, arrays. C/C++ code execute in Linux platform.

LEARNING OUTCOMES

After the completion of the course the students will able to learn:

CO1**.** About the Linux installation & working of Linux commands.

CO2. Know the network related activities on the computer system.

CO3. Expertise in shell programming using Linux.

CO4. The student will learn about System Administration in Linux.

Text Book:

1. Sumitabh Das, “Unix Concepts and applications”, TMH, 2003

2. *Mike Joy, Stephen Jarvis, Michael Luck, “Introducing Unix and Linux”, Palgrave Macmillan.*

Reference Book:

1. O'Reilly Media “Linux System Administration”

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC461	Subject Title	Solid State Microwave Devices						
LTP	3 0 0	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VII

OBJECTIVE:

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to understand Solid-state devices which have had a major impact on the development of microwave and millimeter-wave systems.

UNIT I:Evolution and Uniqueness of Semiconductor Technology:

Equilibrium carrier concentration, Thermal Equilibrium and wave particle duality, intrinsic semiconductor, Extrinsic semiconductor and band models, Carrier transport, Random motion, Drift and diffusion. Excess carriers Injection level, Direct and indirect semiconductors.**7L**

UNIT II: Introduction: Tunnel diode and Microwave transistor:

Microwave Tunnel Diodes- Principles of Operation, Microwave Characteristics, Microwave Bipolar Transistors-, Physical Structures, Bipolar Transistor Configurations, Principles of Operation, Amplification Phenomena, Power-Frequency Limitations Heterojunction Bipolar Transistors (HBTs)-Physical Structures, Operational Mechanism, Electronic Applications. **8L**

Unit III: Microwave Field-Effect Transistors:

Introduction - Junction Field-Effect Transistors (JFETs)-Physical Structure, Principles of Operation,
Metal-Semiconductor Field-Effect Transistors(MESFETs) -Physical Structures, Principles of Operation, Small-Signal Equivalent Circuit, Drain Current h , Cutoff Frequency fco and Maximum Oscillation Frequency. Metal-Oxide-Semiconductor Field-Effect Transistors (MOSFETs) - Physical Structures, Electronic Mechanism, Modes of Operation, Drain Current and Transconductance, Maximum Operating Frequency, Electronic Applications

8L

UNIT IV:Transferred Electron Devices (TEDs):

Introduction - Gunn-Effect Diodes-GaAs Diode- Gunn Effect, Ridley-Watkins--Hilsum (RWH) Theory , Differential Negative Resistance, Two-Valley Model Theory, High-Field Domain, Modes of Operation, Criterion for Classifying the Modes of Operation, Gunn Oscillation Modes, Limited-Space-Charge Accumulation (LSA) Mode, Stable Amplification Mode, LSA Diodes , InP Diodes **8L**

UNIT V: Avalanche Transit-Time Devices andMicrowave Devices Applications

Introduction -Read Diode - Physical Description, Avalanche Multiplication, Carrier Current and External Current, IMPATT Diodes and TRAPATT Diodes - Physical Structures, Negative Resistance, Principles of Operation Power Output and Efficiency. Microwave solid state devices Applications - transmitter and receiver (Sat com /wireless com) , C band Ku band transmitter and receiver **8L**

Text Books:

1. Samuel Y Liao, “Microwave Devices & Circuits” , Prentice Hall of India, 2006.
2. Reinhold.Ludwig and Pavel Bretshko ‘RF Circuit Design”, Pearson Education, Inc.,2006

Reference Books:

1. I.Kneppo , J.Fabian & M.Pavel “Microwave Integrated Circuits” Springer international edition.
2. Peter A RIZZI “Microwave Engineering Passive circuits” PHI.
3. I.Kneppo , J.Fabian & M.Pavel “Microwave Integrated Circuits” Springer international edition.
4. Robert. E.Collin-Foundation of Microwave Engg –Mc Graw Hill.

LEARNING OUTCOME:

The course provides an understanding of:

- Concept of microwave semiconductor devices- BJTs and FETs, Gunn diode, TRAPATT etc.
- Aboutmicrowave semiconductor devices used to realized amplifiers and oscillators in microwave application.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC462	Subject Title	Digital Image Processing						
LTP	2 0 2	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VII

OBJECTIVE:

- To learn the fundamentals of Digital Image Processing
- To learn the basic operations of Digital Image Processing
- To develop the algorithms for DIP
- To study various transforms and filters used in DIP.

UNIT I: Fundamentals of Digital Image Processing:

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter.**8L**

UNIT II: Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Low pass Filters; Sharpening Frequency Domain Filters – Gaussian High pass Filters. Image Restoration**:** A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Band pass Filters; Minimum Mean-square Error Restoration. **8L**

UNIT III: Colour Image Processing:

Colour Image Processing: Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation. Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening. **8L**

UNIT IV: Image Registration & Segmentation:

Registration: Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Dept

Segmentation: Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern

Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection. **8L**

UNIT V:

Feature Extraction: Representation, Topological Attributes, Geometric Attributes.

Description: Boundary-based Description, Region-based Description, Relationship.

Object Recognition: Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, TreeSearch, Graph Matching. **7L**

Text Books:

1. Rafael C. Gonzalvez and Richard E.Woods., Digital Image Processing 2nd Edition, Pearson Education.

Reference Books:

1. A.K. Jain. , Fundamentals of Digital Image Processing, Prentice Hall, Upper Saddle River, NJ.
2. R.J. Schalkoff. ,Digital Image Processing and Computer Vision, John Wiley and Sons, NY.

LEARNING OUTCOME:

The course provides an understanding of:

- Digital Image Processing and its scientific significance.
- Skill to develop the algorithm for digital image processing.
- Skills to use digital signal processing in various applications.

List of Experiment:

1. Display of Gray scale Images.
2. Histogram Equalization.
3. Design of Non-linear Filtering
4. Determination of Edge detection using Operators.
5. 2-D DFT and DCT
6. Filtering in frequency domain.
7. Display of color images.
8. Conversion between color spaces.
9. DWT of images.
10. Segmentation using watershed transform

List of Two Value Added Experiments:

1. Program for illustrating colour image processing.
2. Mini Project.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC463	Subject Title	OPTICAL FIBRE COMMUNICATION						
LTP	2 0 2	Credit	3.0	Subject Category	Deptt.core	Year	4th	Semester	VII

OBJECTIVE:

- Compute and simulate the modes in slab waveguide, step index fiber and graded index fiber.
- Calculate and simulate optical fiber parameters.
- Calculate and simulate the attenuation and signal degradation in fiber.
- Understand the structure, the performance and the signal analysis of optical sources and detectors.
- Design optimum single mode and multimode fiber link

UNIT I: Overview of Optical fiber Communications:

Optical Spectral bands, Evolution of fiber optic system, Elements of an optical fiber transmission link, transmission widows, advantages of optical fiber link over conventional systems, applications of fiber optic transmission systems. Optical fibers: Structures, Waveguiding : Optical fiber modes and configurations, Mode theory, Step Index and Graded Index (GI) fibers ,single mode and multimode fibers, Derivation for numerical aperture, V number and modes supported by step index fiber, mode field diameter, Numerical aperture and modes supported by GI fibers, fiber materials, linearly Polarized modes. **8L**

UNIT II: Signal Degradation in Optical Fibers :

Signal distortion in optical waveguides, attenuation, scattering loss, bending loss, pulse broadening in multimode fiber, derivations, graded index fiber, Characteristics of Single Mode Fibers, dispersion in single mode fiber and derivations, dispersion shifted fiber, dispersion flattened fiber. **7L**

UNIT III: Optical sources and power launching:

Optical Sources :Semiconductor Physics background, Light emitting diode (LEDs)- structures, materials, Figure of merits, characteristics & Modulation. Laser Diodes - threshold conditions, Einstein relation.Diode Rate equations, resonant frequencies, structures, characteristics and figure of merits, single mode lasers, Modulation of laser diodes, Spectral width , temperature effects, and Light source linearity. Power Launching and Coupling : Source to fiber power launching, fiber-to-fiber joints, LED coupling to single mode fibers, Splicing single mode fiber

8L

UNIT IV: Photodetectors:

Principles of operation, types of detectors , photodiode materials, photodetector noise, detector response time, temperature effects on gain, comparison of photodetectors. **7L**

UNIT V: Optical Receiver Operation:

Receiver operation, error sources, receiver configuration, Preamplifier types, Eye diagrams, Coherent detection, Specification of receivers

Transmission Systems **:** Point –to-point link –system considerations, Link power budget and rise time budget methods for design of optical link, line coding. **8L**

Text Books:

1. Gerd Keiser, Optical Fiber Communications, third edition, McGraw Hill

Reference Books:

1. John M. Senior, Optical Fiber Communications, PHI/Pearson
2. Djafar Mymbaev & Lowell L, Scheiner, Fiber optical communication Technology, Pearson
3. G. Agrawal, Fiber optic Communication Systems, John Wiley and sons

LEARNING OUTCOME:

- To comprehend the basic elements of optical fiber transmission link, fiber modes
- To visualize the significance of the different kind of losses, signal distortion in optical wave guides, signal degradation factors and dispersion management techniques in optical system performance.
- To compare the various optical source materials, LED structures, quantum efficiency as well as structures and figure of merit of Laser diodes.
- To analyze the fiber optic receiver operation and configuration.
- To analyze the system performance of optical transmitters, receivers.
- To analyze and deign optical fiber link with encapsulation of different system components.

List of Experiments:

1. Setting -up of Analog/ Digital Optical communication Link
2. Measurement of attenuation characteristics of an optical fiber
3. Measurement of NA of a multimode fiber
4. Measurement of Mode field diameter of a single mode fiber.
5. Measurement of Dispersion of optical fiber
6. Performance of PAM,PWM and PPM on fiber optic link
7. Preparation of optical fiber end and practices on splicing/connectorization
8. Setting -up of voice link on Optical communication Link
9. Calculate for Step Index Fibers (using MATLAB): NA, Acceptance Angle, Normalized propagation constant β, V number, Check whether the fiber is single mode or multi mode, graph- b vs V.
10. Calculate for Graded Index Fibers (using MATLAB): Normalized propagation constant β, V number, Check whether the fiber is single mode or multi-mode, graph- b vs V, cut off wabelength.

List of Two Value Added Experiments:

1. Simulation of nonlinear effects and structure of optical fiber using Simulink
2. Simulation of analog and digital optical fiber link using Simulink.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC464	Subject Title	EMERGING TRENDS IN INSTRUMENTATION SYSTEM						
LTP	3 0 0	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VII

OBJECTIVE:

- Smart sensors and their fabrication.
- Concept of bio sensors.
- Concept and application of sensors in agriculture.
- Concept and application of sensors in food processing.

UNIT I: Smart Sensors and Their Applications:

Smart sensor basics, signal conditioning and A/D conversion for sensors, examples of available ICsand their applications: Chemical sensors, biosensors, fibre optic sensors, gas sensors **7L**

UNIT II: Sensor Fabrication:

Theory and classifications of chemical sensors, biosensors, fibre optic sensors, gas sensors. Design considerations and selection criterion as per standards, Sensor fabrication techniques, process details, and latest trends in sensor fabrication **8L**

UNIT III: Instrumentation in Irrigation and Green house System:

Irrigation systems: necessity, irrigation methods: overhead, centre pivot, lateral move, micro-irrigation systems, soil moisture measurement methods: resistance based method, voltage based method, thermal based method, details of gypsum block, Application of SCADA for DAM parameters & control.

Green houses & instrumentation: ventilation, cooling & heating, wind speed, temperature & humidity, rain gauge carbon dioxide enrichment measurement & control. **8L**

UNIT IV: Instruments in Agriculture:

Automation in earth moving equipments & farm equipments, implementation of hydraulic, pneumatic & electronics control circuits in harvesters cotton pickers, tractor etc. classification of pumps: pump characteristics, pump selection & installation. Agro-metrological instrumentation weather stations, surface flux measurement, soil water content measurement using time-domain reflectormetery (TDR). **8L**

UNIT V: Food Processing AND ITS AUTOMATION:

Definition, Food quality measurement, food safety and standards bill 2005, Design consideration: cold storage, atmospheric controller and preservatives; biosensors. Application of SCADA & PLC in food packing industry, Trends in modern food processing, Equipments for creating and maintaining controlled atmosphere. **8L**

Text Books:

1.Sensors and Transducers, D. Patranabis, Second Edition Prentice Hall of India Pvt. Ltd. New Delhi, 2006
2.Biosensors, Raj Mohan Joshi, First Edition, ISHA Books, Delhi, 2006.

Reference Books:

1. Transducers and Instrumentation, D.V.S.Murty, Second edition, PHI publication, Second edition, 2010.
2. Handbook of modern sensors: physics, designs, and applications, Jacob Fraden, Third edition.
3. Understanding Smart Sensors, Randy Frank, Second edition, Artech House sensors library.
4. Smart Sensors, Chapman, P., ISA Publications,1995
5. Irrigation : Theory and Practice, Michael. A.M, Vikas Publishing House Pvt Ltd, 2008.
6. Automatic Control for food processing system, R.G.Moreira, T.P.Coulate, 2001.

LEARNING OUTCOME:

The course provides an understanding of:

- Smart sensors.
- Principle of working of automation of food processing and agriculture.
- Skills to use modern sensors.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC465	Subject Title	NEURAL & FUZZY SYSTEM						
LTP	2 0 2	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VII

OBJECTIVE:

- To understand the fundamental theory and concepts of neural networks.
- To understand the neuro-modelling, several neural network paradigms and its applications.
- To understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control.
- To understand the other machine intelligence applications of fuzzy logic.

UNIT I:Neuron Model and Network Architectures

Neuron Model: Single-Input Neuron, Transfer Functions, Multiple-Input Neuron, Network Architectures: A Layer of Neurons, Multiple Layers of Neurons, Recurrent Networks, Perceptron Model: Two-Input Case, Learning rules Hamming Network: Feedforward Layer, Recurrent Layer, Hopfield Network, Various learning techniques; perception and convergence rule. **8L**

Unit II:Widrow-Hoff Learning and Back Propagation Networks

ADALINE Network: Single ADALINE, Mean Square Error, LMS Algorithm, Perceptron model, solution, multilayer perception model, Back propagation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting back propagation training, applications. **8L**

Unit III: Fuzzy Logic-I (Introduction):

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory versus probability theory, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

7L

Unit IV: Fuzzy Logic –II (Fuzzy Membership, Rules):

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzifications, Fuzzy Controller. **8L**

Unit V: Application of Neural Network and Fuzzy logic:

Application of Neural Network: Description of the Smart Sensor System, Chemical vapor deposition (CVD) of fabricating ICs, Myocardial Infarction Recognition systems. Application of Fuzzy Systems: Industrial applications of fuzzy logic **8L**

Text Books:

1.Martin T. Hagan, "Neural Network Design", CENGAGE LEARNING 2nd Edition.

Reference Books:

1.Siman Haykin,"Neural Networks "Prentice Hall of India

2.Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India 3rd Edition.

3.S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India.

LEARNING OUTCOME:

After completion of this course the student will:

- Be able to conceptualize the feed forward neural networks.
- Be able to define feedback networks.
- Be able to conceptualize the fuzziness involved in various systems and fuzzy set theory.
- Be able to define fuzzy logic control and adaptive fuzzy logic.
- Be able to design the fuzzy control.

List of Experiments:

1. Calculate the output of a simple neuron
2. Create and view custom neural networks
3. Classification of linearly separable data with a perceptron
4. Classification of a 4-class problem with a 2-neuron perceptron
5. ADALINE time series prediction with adaptive linear filter
6. Classification of an XOR problem with a multilayer perceptron
7. Classification of a 4-class problem with a multilayer perceptron
8. Radial basis function networks for function approximation
9. Classification with a 2-layer perceptron
10. Pattern association with a linear neuron

List of Two Value Added Experiments:

1. Character Recognition using Hopfield network
2. Classification with a 2-neuron perceptron

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC466	Subject Title	DESIGN OF COMMUNICATION SYSTEM						
LTP	3 0 0	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VII

OBJECTIVE:

- To understand the concept of Radio Communication System design and their performance
- To understand the basics of Radio circuit design for communication networks
- To learn the basics of receiver design and with different – different modulation techniques
- To understand the concept of frequency synthesis and Frequency Mixing

UNIT I: Radio Communication Systems, Network Noise & Intermodulation Distortion:

Introduction to Radio Communication Systems , Noise sources, noise measures, design of low noise networks, inter-modulation distortions. Frequency selective networks and transformers: Series resonant circuits, parallel resonant circuits with transformers, impedance matching and harmonic filtering using reactive networks. **8L**

UNIT II: Radio Circuits & Amplifiers:

General features of audio amplifiers, audio mixers, Wideband amplifiers: Review of high frequency analysis of BJT and FET amplifiers, input compensation, neutralization and feedback techniques for wide banding cascade amplifiers, high frequency amplifiers using MOSFETS **7L**

UNIT III: Phase Locked Loop Circuits

Basic PLL operation, transient response of PLL, Linear model of the PLL- 1st order, 2nd order PLL, lock range and capture range, phase detectors, PLL application- tracking filters, angle modulation, frequency demodulation, amplitude demodulation, phase shifters, signal synchronizers, frequency translators PLL IC 565, digital PLL. **8L**

UNIT IV: Frequency Synthesizers:

Direct frequency synthesis, frequency synthesis by phase lock, 565 as frequency synthesizer, effect of reference frequency on loop performance variable modulus dividers, down conversion, methods for reducing switching time, multiple loop frequency synthesizer, fractional N loops, direct digital synthesis, synthesizer design. **8L**

UNIT V: Mixers ,Modulators & Demodulators

Frequency mixers, switching type mixers, diode ring mixers, square law mixers, BJT and FET mixers, review of balanced modulator principle, applications of balanced modulator, IC based Balance modulator/demodulator, amplitude modulators, product detector, frequency doubler, AM generation and detection. **8L**

Text Books:

1.Modern Communication Circuits-Jack Smith, Mc-Graw Hill publication

Reference Books:

1.Stensby, J. L., Phase Locked Loops, CRC Press LLC, Boca Raton, FL, 1997.
2. Bowick, C., RF Circuit Design, Newnes Publishing, Burlington, MA, 1982.
3. McClaning, K. and Vito, T., Radio Receiver Design, Noble Publishing Corp., Atlanta, GA, 2000.
4.Tomasi, W., Advanced Electronic Communications Systems, Fifth Edition, Prentice-Hall Inc., Englewood Cliffs, NJ, 2001.

LEARNING OUTCOME:

The course provides an understanding of:

- Basic Receivers design for radio communication.
- Noise Performance of Communication Networks
- Skills to use Modern Communication system design.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC467	Subject Title	OPTIMIZATION THEORY						
LTP	3 0 0	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VII

OBJECTIVE:

- To introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming.
- Constrained and unconstrained optimization techniques for solving and optimizing an electrical and electronic engineering circuits design problems in real world situations.
- To explain the concept of Dynamic programming and its applications to project implementation

UNIT I Introduction and Classical Optimization Techniques:

Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems. Classical Optimization Techniques: Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints – Kuhn – Tucker conditions. **8L**

UNIT II Linear Programming:

Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm. Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems. **8L**

UNIT III Unconstrained Nonlinear Programming:

One dimensional minimization methods, Classification, Fibonacci method and Quadratic interpolation method Unconstrained Optimization Techniques: Univariant method, Powell's method and steepest descent method. **7L**

UNIT IV Constrained Nonlinear Programming:

Characteristics of a constrained problem – classification – Basic approach of Penalty Function method – Basic approach of Penalty Function method – Basic approaches of Interior and Exterior penalty function methods – Introduction to convex programming problem. **8L**

UNIT V Dynamic Programming:

Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution – examples illustrating the tabular method of solution. **8L**

Text Books:

1. Singiresu S. Rao, Engineering Optimization: Theory and Practice by John Wiley and Sons, 4th edition, 2009.
2. H. S. Kasene & K. D. Kumar, Introductory Operations Research, Springer (India), Pvt. Ltd., 2004

Reference Books:

1. George Bernard Dantzig, Mukund Narain Thapa, “Linear programming”, Springer series in operations research 3rd edition, 2003.
2. H.A. Taha, “Operations Research: An Introduction”, 8th Edition, Pearson/Prentice Hall, 2007.
3. Kalyanmoy Deb, “Optimization for Engineering Design – Algorithms and Examples”, PHI Learning Pvt. Ltd, New Delhi, 2005.

LEARNING OUTCOME:
The student will be able to

- explain the need of optimization of engineering systems
- understand optimization of electrical and electronics engineering problems
- apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
- apply unconstrained optimization and constrained non-linear programming and dynamic programming
- Formulate optimization problems.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC469	Subject Title	REAL TIME OPERATING SYSTEM						
LTP	3 0 0	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VII

OBJECTIVE:

Students completing this course will have an in-depth understanding of issues in real time operating systems, importance of deadlines and concept of task scheduling. They should be able to:

- To understand the aspects of Real Time Embedded concepts
- To learn the Essentials of Open Source RTOS and their usage
- To select the proper technique to design a Real-Time System
- To build the device driver and kernel internal for Embedded OS and RTOS
- To learn and apply the knowledge of Memory systems

UNIT I Fundamentals of Operating Systems:

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. **8L**

UNIT II:OPEN SOURCE RT-OS Basics of RTOS:

Real-time concepts, Hard Real time and Soft Real-time, Differences between General Purpose OS & RTOS, Basic architecture of an RTOS, Scheduling Systems, Inter-process communication, Performance Matric in scheduling models, Interrupt management in RTOS environment, Memory management, File systems, I/O Systems, Advantage and disadvantage of RTOS. POSIX standards, RTOS Issues – Selecting a Real-Time Operating System, RTOS comparative study. **8L**

UNIT III :EMBEDDED OS INTERNALS I:

Linux internals: Process Management, File Management, Memory Management, I/O Management. Overview of POSIX APIs, Threads: Creation, Cancellation, POSIX Threads, Inter Process Communication: Semaphore, Pipes, FIFO, Shared Memory **7L**

UNIT IV :EMBEDDED OS INTERNALS II:

Kernel: Structure, Kernel Module Programming Schedulers and types of scheduling. Interfacing: Serial, Parallel Interrupt Handling Linux Device Drivers: Character, USB, Block & Network. **7L**

UNIT V:REAL TIME KERNEL BASICS:

Converting a normal Linux kernel to real time kernel, Xenomai basics. Overview of Open source RTOS for Embedded systems (Free RTOS/ ChibiosRT) and application development.Real Time Operating Systems: Event based, process based and graph based models, Petrinet models. Real time languages, real time kernel, OS tasks, task states, task scheduling, interrupt processing, clocking, communication and Synchronization. Control blocks, memory requirements and control, kernel services, basic design using RTOS.Real Time Operating Systems: Event based, process based and graph based models, Petrinet models. Real time languages, real time kernel, OS tasks, task states, task scheduling, interrupt processing, clocking, communication and Synchronization. Control blocks, memory requirements and control, kernel services, basic design using RTOS.

8L

Text Books:

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley.

Reference Books:

1. Sibsankar Halder and Alex A Aravind, “Operating Systems”, Pearson Education.
2. Harvey M Dietel, “An Introduction to Operating System”, Pearson Education
3. Embedded system: Architecture Programming and Design, Raj kamal, TMH Publication, 2011
4. Jerry Cooperstein , ”Writing Linux Device Drivers: A Guide with Exercises”, J. Cooperstein publishers ,2009
5. Qing Li and CarolynYao,”3Real Time Concepts for Embedded Systems – Qing Li, Elsevier, CMP Books © 2003
6. KVK Prasad, ”Embedded/Real Time Systems Concepts, Design and Programming Black Book”, , Wiley India 2003
7. Ward, Paul T & Mellor, Stephen,” Structured Development for Real - Time Systems v1, v2,V3 : Implementation ModelingTechniques “ Prentice hall, 2015
8. Seppo J. Ovaska Phillip A. Laplante,”Real-Time Systems Design and Analysis:Tools for the Practitioner”, 4ed Paperback – 17 May 2013.
9. An Embedded Software Primer, David E. Simon Pearson Education Asia Publication
10. Real Time Systems, C.M. Krishna and Kang G. Shin, TMH Publication
11. D M Dhamdhere, “Operating Systems: A Concept based Approach”, 2nd Edition.

LEARNING OUTCOME:

After completion of this course the student will:

- Have basic understanding of Real Time Operating Systems.
- Be able to summarize the issues in real time computing.
- Be able to perform CPU scheduling and apply them to real time industrial applications.
- Be able to interpret the feasibility of a task set.
- Be able to apply the knowledge of Memory systems.
- Be able to build the device driver and kernel internal for Embedded OS and RTOS

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EE403	Subject Title	MATLAB for Engineers						
LTP	3 0 2	Credit	4.0	Subject Category	Elective	Year	4th	Semester	VII

OBJECTIVE:

- 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 I

Basics MATLAB environment, Variables, Basic data types, Relational and Logic operators, Conditional statements, Input and Output, Loops and branching. **7L**

UNIT II:

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 III:

Simulink Introduction, Block diagram, Functions, Creating and working with models, Defining and managing signals, running a simulation, analysing the results. **8L**

UNIT IV:

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 V:

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.
- Student will be able to use MATLAB for data analysis and graphical visualization.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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]:

1. Tay Vaughan "Multimedia, Making IT Work" Osborne McGraw Hill,7th edition
2. 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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EE481	Subject Title	NEW AND RENEWABLE ENERGY SOURCES						
LTP	3 0 0	Credit		Subject Category	Open Elective	Year	4th	Semester	VII

Objectives of the Course

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

Unit 1	**Introduction :**Energy resources and their classification, oil crisis of late 20th century and its impacts on energy planning, consumption trend of primary energy sources, world energy future, energy audit and energy conservation, energy storage.	**8L**
Unit 2	**Solar Energy Conversion** :Solar resources, passage through atmosphere, solar thermal energy conversion: solar energy collectors, solar thermal power plant, solar PV conversion: solar PV cell, V-I characteristics, MPPT, Solar PV power plant and applications.	**8L**
Unit 3	**Biomass Energy Conversion :** Usable forms of Bio Mass, Biomass energy resources, biomass energy conversion technologies, ethanol blended petrol and diesel, biogas plants. Energy farming.	**8L**
Unit 4	**Wind Energy Conversion :** Wind Power: Energy estimation, Power extraction, lift and drag forces, horizontal axis wind turbine, vertical axis wind turbine, wind energy conversion and control schemes, environmental aspects.	**8L**
Unit 5	**Other Alternate Energy Sources/Technologies:** Geothermal Energy: geothermal fields, types, geothermal energy generation systems, ocean tidal energy systems, fuel cell: basic operation and classification, principle of MHD generation, output voltage and power, environmental aspects.	**8L**

Text Books:

1. B.H. Khan, Non conventional Energy Resources, 2nd edition, 2009.

Reference Books

1. G.D. Rai, Non Conventional Sources of Energy, (Khanna Publishers).
2. J.W. Twidell& A.D. Weir, Renewable Energy Resources, (ELBS / E. & F.N. Spon., London).
3. Godfrey Boyle, Renewable Energy, Oxford, 2nd edition 2010.

Outcome of the Course:

- **Identify renewable energy sources.**
- **Understand the mechanism of solar, wind and ocean energy sources.**
- **Demonstrate the understanding of various technologies involved in power generation from renewable energy sources.**

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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:

1. Freund E F John, Mathematical statistics, 6th edition, Prentice Hall International, 1999.
2. Hogg, R. V. and Craig, T. T. (1978) Introduction to Mathematical Statistics (Fourth Edition) (Collier-McMillan).
3. Rohatgi, V. K. (1988) Introduction to Probability Theory and Mathematical Statistics (Wiley Eastern).

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EE441	Subject Title	POWER QUALITY						
LTP	3 1 0	Credit	4.0	Subject Category	Elective	Year	4th	Semester	VII

OBJECTIVE:

- 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 I

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 II:

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 III:

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 equipment's and communication systems, power measurement. **8L**

UNIT IV:

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. **7L**

UNIT V:

Active Power filters: Compensation principle, classification of active filters by objective, systems configuration, power circuit and control strategy.

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, equipment's and develop the ability to analyse the measured data

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EE443	Subject Title	ELECTRIC DRIVES						
LTP	3 0 2	Credit	4.0	Subject Category	Elective	Year	4th	Semester	VII

OBJECTIVE:

- 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 I

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 II:

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 **7L**

UNIT III:

Electric Braking: Purpose and types of electric braking, braking of dc, three phase induction and synchronous motors

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 IV:

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 V:

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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:

2. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag., 2nd edition 2004
3. Bruce Schiener, "Applied Cryptography", Wiley; 2nd edition 2007

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS452	Subject Title	Information Storage and Management *(Departmental Elective 7)*						
LTP	3 0 0	Credit	3	Subject Category	DE	Year	4th	Semester	VII

OBJECTIVES:

The objective of the course to provide the knowledge to students about components of managing and monitoring the data center and define information security and identify different storage virtualization technologies.

UNIT-I **(7 L)**

Introduction to Storage Technology: Data creation and The value of data to a business, Information Lifecycle, Challenges in data storage and data management, Solutions available for data storage, Core elements of a Data Center infrastructure, role of each element in supporting business activities.

UNIT-II **(7 L)**

Storage Systems Architecture: Hardware and software components of the host environment, Key protocols and concepts used by each component ,Physical and logical components of a connectivity environment ,Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components, Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Integrated and Modular storage systems ,high-level architecture and working of an intelligent storage system

UNIT-III **(7 L)**

Introduction to Networked Storage: Evolution of networked storage, Architecture, components, andtopologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, Understand the need for long-term archiving solutions and describe how CAS fulfil the need, Understand the appropriateness of the different networked storage options for different application environments.

UNIT-IV **(8 L)**

Information Availability, Monitoring & Managing Data Center: Reasons for planned/unplanned outagesand the impact of downtime, Impact of downtime. Differentiate between business continuity (BC) and disaster recovery (DR), RTO and RPO, Identification of single points of failure in a storage infrastructure and solutions to mitigate these failures, Architecture of backup/recovery and the different backup/ recovery topologies, replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities. Key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor storage infrastructure.

UNIT-V **(8 L)**

Securing Storage and Storage Virtualization: Information Security, Critical security attributes forinformation systems, Storage security domains, Analyze the common threats in each domain. Storage Virtualization: Forms, Configurations and Challenges. Types of Storage Virtualization: Block-level and File-Level.

LEARNING OUTCOMES

CO1. Explain the data storage technologies and storage system environment

CO2. Discuss about different network storage and content addressed storage.

CO3. Apply the RAID concepts for data protection and explain the working of intelligent storage system.

CO4. Describe the storage virtualization techniques and Information Availability & Monitoring & Managing Datacenter

Text Books:

1. Robert Spalding, “Storage Networks: The Complete Reference”, Tata McGraw Hill, New Delhi, 2006.
2. Somasundaram G, AlokShrivastava, “ISM – Storing, Managing and Protecting Digital Information”, EMC Education Services, Wiley India, New Delhi, 2012.

Reference Books:

1. Gerald J Kowalski, Mark T Maybury, “Information Storage and Retrieval Systems: Theory and Implementation”, BS Publications, New Delhi, 2009.
2. Marc Farley Osborne, “Building Storage Networks”, Tata McGraw Hill, New Delhi, 2001.
3. Meeta Gupta, “Storage Area Network Fundamentals”, Pearson Education, New Delhi, 2002

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS453	Subject Title	Parallel Computing *(Departmental Elective 7)*						
LTP	3 0 0	**Credit**	3	**Subject Category**	DE	**Year**	4th	**Semester**	VII

OBJECTIVES: Students undergoing this course are expected to learn different parallel programming models along with the technologies that enabling parallel computing

Unit-1 **(5 L)**

Introduction

Why parallel computing? Shared memory and distributed memory parallelism, Amdahl's law, speedup and efficiency, supercomputers.

Unit-2 **(8 L)**

Message passing

MPI basics, point-to-point communication, collective communication, synchronous/asynchronous send/receive, algorithms for gather, scatter, broadcast, reduce.

Unit -3 **(9 L)**

Parallel communication

Network topologies, network evaluation metrics, communication cost, routing in interconnection networks, static and adaptive routing, process-to-processor mapping.

Unit- 4 **(8 L)**

Performance, Designing Parallel codes

Scalability, benchmarking, performance modeling, impact of network topologies, parallel code analysis and profiling. Domain decomposition, communication-to-computation ratio, load balancing, adaptivity.

Unit -5 **(8 L)**

Parallel I/O

MPI I/O algorithms, contemporary large-scale I/O architecture, I/O bottlenecks.
RDMA, extreme scale computing: issues and trends.

LEARNING OUTCOMES

CO1. Ability to explain the different types of interconnection networks.
CO2. Ability to demonstrate the concepts Parallel Algorithms
CO3. Ability to demonstrate the concepts of Shared memory Based parallel Computers
CO4. Ability to demonstrate different parallel programming models

Text Book:

1. Peter S Pacheco, An Introduction to Parallel Programming, Morgan Kaufmann, 2011.
2. DE Culler, A Gupta and JP Singh, Parallel Computer Architecture: A Hardware/Software Approach Morgan-Kaufmann, 1998.
3. Marc Snir, Steve W. Otto, Steven Huss-Lederman, David W. Walker and Jack Dongarra, MPI - The Complete Reference, Second Edition, Volume 1, The MPI Core.
4. William Gropp, Ewing Lusk, Anthony Skjellum, Using MPI : portable parallel programming with the message-passing interface, 3rd Ed., Cambridge MIT Press, 2014.
5. A Grama, A Gupta, G Karypis, and V Kumar, Introduction to Parallel Computing. 2nd Ed., Addison-Wesley, 2003.

Reference Book:

1. JL Hennessy and DA Patterson, Computer Architecture: A Quantitative Approach, 4th Ed., Morgan Kaufmann /Els India, 2006.
2. MJ Quinn, Parallel Computing: Theory and Practice, Tata McGraw Hill, 2002.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS454	Subject Title	Introduction to Genetic Algorithms & Fuzzy Logic *(Departmental Elective 7)*						
LTP	3 0 0	**Credit**	3	**Subject Category**	DE	**Year**	4th	**Semester**	VII

OBJECTIVES:

This course aims to give the students to the knowledge & applications in various areas of Fuzzy logic & Genetic algorithms.

UNIT 1 **(7L)**

Fuzzy Sets (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory, Basic operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT2 **(7L)**

Fuzzy Logic (Fuzzy Membership, Rules)

Membership functions, Propositional logic and predicate logic, Inference in fuzzy logic, Fuzzy if-then rules, Fuzzy mapping rules, Fuzzy implications, Min-Max Theorem, Resolution Rule under Fuzzy environment, Refutation method for theorem proving, Defuzzifications,

UNIT3 **(8L)**

Reasoning with uncertain and incomplete information: The statistical approach to uncertainty, Introduction, Uncertain & incomplete knowledge. Review of Probability theory

UNIT4 **(8L)**

Bayes Theorem, Bayesian Networks, Bayesian reasoning. Decision Making, Joint Probabilities, Relationships, Polytrees., Dempster-Shafer theory of evidence, Certainty Factor, Non-monotonic systems.

UNIT 5 **(8L)**

Theoretical Foundation of Genetic Algorithms

Introduction: Basic Operators: Reproduction, Crossover & Mutation. Fitness function. Search Space, Schemas & Two-Armed and k-armed problem, Exact mathematical models, Applications of Genetic Algorithms.

LEARNING OUTCOMES

At the end of the course students will get exposure about

CO1. Introduction of fuzzy logic.
CO2. Fuzzy membership and its rules.
CO3. Genetic algorithm with its applications

Text Book:

1. G.J.Klir , Yuan,"Fuzzy Sets and fuzzy logic, Theory and applications", Prentice Hall India, 1995.
2. David E. Goldberg, "Genetic algorithms in search, optimization & Machine Learning" Pearson Education, 2006
3. Stuart Russel, Peter Norvig, "Artificial Intelligence A Modern Approach" Pearson 3rd Edition 2015.

Reference Book:

1. John Yen, Reza Langari, "Fuzzy Logic Intelligence, Control and Information", Pearson Education, 2006.
2. Timothy J Ross, "Fuzzy Logic with Engineering Applications", 2nd Edition, John Wiley, 2004.
3. H. Zimmermann, "Fuzzy Set Theory and its applications", 2nd Edition, Allied Publishers, 1996.
4. Melanle Mitchell, "An introduction to genetic algorithms", Prentice Hall India, 2002.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

1. The Sustainability Revolution: Portrait of a Paradigm Shift by Edwards, Andres R., New Society Publishers, 2005.
2. Sustainable development in India: Stocktaking in the run up to Rio+20: Report prepared by TERI for MoEF, 2011.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC471	Subject Title	NANOTECHNOLOGY						
LTP	3 0 0	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VIII

OBJECTIVE:

- Fundamental physical scaling laws applied to understanding the properties of materials at the nanometre scale.
- Experimental and computational characterization of Nano materials.
- Self-assembly, surfaces and interfaces in nanotechnology.

Unit I Introduction to Nanotechnology:

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. **9L**

UNIT II:

Nanomaterials -synthesis techniques; top-down and bottom-up techniques, ball milling, PVD, CVD, self-assembly. **7L**

UNIT III:

Nanomaterials characterization; XRD, SEM, TEM, AFM, UV-VIS. **8L**

UNIT IV:

Nanomaterials and their properties: carbon based nano materials, metal based nano materials, quantum dots, biologicalnano materials. **8L**

UNIT V:

Applications of nanotechnology in engineering, solar energy conversion, nanomedicine. **7L**

Text Books:

1. Poole, Jr. CP and Owens, FJ, "Introduction to Nanotechnology", Wiley India. 2006.

Reference Books:

1. Edward L. Wolf: Nanophysics and Nanotechnology: An Introduction to Modern Concepts in Nanoscience, 2nd ed., Wiley-VCH, 2006.
2. Cao, G., Nanostructures and Nanomaterials: Synthesis, Properties and Applications, Emperial College Press (2004).

Outcome of the Course:

- Demonstrate the understanding of length scales concepts, nanostructures and nanotechnology.
- Identify the principles of processing, manufacturing and characterization of nanomaterials and nanostructures.
- Evaluate and analyze the mechanical properties of bulk nanostructured metals and alloys, nanocomposites and carbon nanotubes.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC472	Subject Title	PHOTONICS						
LTP	3 0 0	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VIII

OBJECTIVE:

- Physical principles and engineering applications of optical field.
- Design principles covering the behaviour of optical components and photonic devices

Unit I Fundamentals of Photonics:

Photon Optics: The photon, Photon Streams, Quantum States of Light; Photons and Atoms: Interactions of Photons with Atoms; Thermal Light, Luminescence Light; Photons in Semiconductors: Interactions Photons with Electrons and Holes; Optical waveguides. **8L**

UNIT II: Semiconductor Photon Sources and Detectors:

Semiconductor Photon Sources: LEDs, Semiconductor Laser Amplifiers, Semiconductor Injection Laser; Semiconductor Photon Detectors: Properties of Semiconductor; Photodetectors, Photoconductors, Photodiodes. Avalanche Photodiodes, Noise in Photodetectors. **8L**

UNIT III: Dynamic and Active devices and Applications:

Electro-optic devices, Acousto-optic devices, Thermo-optic and magneto-optic device, Integrated optical amplifiers. Applications Examples: fiber optic sensors; Optical signal processing. **8L**

UNIT IV: Photonic switching and computation

Photonics Switches, All-Optical Switches ,Bistable Optical Devices, Optical interconnects ,Optical computing. **7L**

UNIT V: Integrated Photonic Circuits:

Nonlinear integrated optics ;Opto-electronic integrated circuits; Silicon based photonic integrated circuits; Nano photonic structures; Bio photonic applications. **8L**

Text Books:

1. Saleh and Teich,"Fundamentals of Photonics" second edition, Wiley, 2007

Reference Books:

1. C R Pollock and M Lipson: Integrated photonics, Kluwer Pub, 2003
2. T Tamir, Guided wave opto-electronics, Springer Verlag, 1990.
3. W. Lucke, "Introduction to Photonics"

Outcome of the Course:

The course provides an understanding of:

1. The basic physics behind optoelectronic devices.
2. Develop basic understanding of light emitting sources and detectors.
3. Develop detailed knowledge of photonic devices and sensors.
4. Acquire detailed knowledge of photonic switching devices for photonic integrated circuits.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC473	Subject Title	AUTOMOTIVE ELECTRONICS						
LTP	3 0 0	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VIII

Objectives:

- To understand the starting methods of a vehicle.
- To know the functioning of ignition systems and use of electronics for controlling purpose.
- To understand the use of sensors and actuators in the automotive unit.

UNIT I: Power Source and Starting Methods for Automotive Unit

Batteries: Principles and construction of lead-acid battery, characteristics of battery, rating capacity and efficiency of batteries, various tests on battery condition, charging methods, constructional aspect of alkaline battery.

Starting System: Condition at starting. Behavior of starter during starting, series motor and its characteristics, principle & construction of starter motor, working of different starter drive units, care and maintenance of starter motor, starter Switches. **8L**

Unit II: Ignition systems and Lighting System & Accessories:

Ignition Systems: Types, construction & working of battery coil and magneto ignition systems, relative merits, centrifugal and vacuum advance mechanisms, types and construction of spark plugs, electronic ignition systems. Lighting System & Accessories: Insulated & earth return systems, positive & negative earth systems. details of head light & side light, headlight dazzling & preventive methods, electrical fuel-pump, Speedometer, fuel, oil & temperature gauges, Horn, wiper system. **8L**

Unit III: Automotive Electronics:

Current trends in modern automobiles Open and close loop systems-Components for electronic engine management, electronic management of chassis system, vehicle motion control **7L**

Unit IV: Sensors and Actuators:

Basic sensor arrangement, Types of sensors such as-Oxygen sensors, Crank angle position sensors-Fuel metering/vehicle speed sensor and detonation sensor- Altitude sensor, flow sensor, throttle position sensors. Solenoids, stepper motors, and relays Electronic Fuel Injection and Ignition Systems: Introduction, feedback carburetor systems. Throttle body injection and multi-port or point fuel injection, fuel injection systems, Injection system controls, Advantages of electronic ignition systems: Types of solid-state ignition systems and their principle of operation, Contact less electronic ignition system, and electronic spark timing control. **8L**

Unit V: Digital Engine Control System:

Digital Engine Control System: Open loop and closed loop control systems-Engine cranking and warm up control-Acceleration enrichment- Deceleration leaning and idle speed control, distributor less ignition-Integrated engine control systems, Exhaust mission control engineering, electronic dashboard instruments-Onboard diagnosis system, security and warning system. **8L**

Text Books:

1. Judge. A.W, 'Modern Electrical Equipment of Automobiles', Chapman & Hall, London, 1992.
2. William B. Ribbens, 'Understanding Automotive Electronics', 5th Edition, Butterworth, Heinemann Woburn, 1998.

Reference Books:

1.Vinal. G.W., 'Storage Batteries', John Wiley & Sons Inc., New York, 1985.
2. Robert Bosch,'Automotive Hand Book', Bently Publishers, 1997.

OUTCOMES OF THE COURSE:

After completion of this course the student will:

- To understand the Fundamentals of automotive electronics.
- To understand the needs of Sensors for various automotive applications.
- To have an overview of electrical and electronic systems used in vehicles.
- To understand Electronic fuel injection and ignition systems
- To know the important of actuators and control system in Automobiles.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC474	Subject Title	SATELLITE COMMUNICATION						
LTP	3 0 0	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VIII

Objectives:

- To introduce the students to Satellite systems and their functioning
- To understand the orbital dynamics and satellite launching mechanism.
- To understand the space segment and the functioning of various satellite subsystems
- To understand the Earth station system architecture and satellite link design
- To understand the latest satellite mobile services and specialised services in use.

UNIT I: OVERVIEW OF SATELLITE SYSTEMS, ORBITS AND LAUNCHING METHODS:

Evolution of satellite systems, Basic elements of a satellite system, Satellite Frequency bands, Orbital Satellites, Kepler's Laws, Orbital Elements, Solar time and Sidereal Time, Satellite orbits, Orbital perturbations, Look angles, Satellite launching Mechanism. **8L**

UNIT II: SPACE SEGMENT:

Introduction to satellite subsystems, Transponder subsystem, Antenna Subsystem, AOCS, TT&C Subsystem, Communication Subsystems, Power Subsystem, Thermal Subsystem, Reliability and Quality Assurance . **7L**

UNIT III: EARTH SEGMENT & SATELLITE LINK DESIGN:

Earth Segment: Elements of earth station, Types of earth station – FSS, BSS, MSS, Earth station architecture, Earth station design considerations, Earth station testing

Satellite Link design: basic transmission equation, Satellite uplink model, Satellite downlink model, Transponder model, Link Equations, Noise considerations-Thermal Noise, Noise Factor, Noise Figure, Noise Temperature, Antenna Noise Temperature, , Overall System Noise Temperature, Noise calculation for cascaded stages, G/T ratio for earth stations. **8L**

UNIT IV: SATELLITE MULTIPLE ACCESS TECHNIQUES:

FDMA: Single Access – Pre assigned FDMA, Demand-Assigned FDMA, SPADE System. Bandwidth-limited and Power-limited TWT amplifier operation, FDMA downlink analysis.

TDMA: Reference Burst; Traffic Date, Frame Efficiency and Channel capacity, pre-assigned TDMA, Demand assigned TDMA.

CDMA: Direct Sequence CDMA system, Frequency Hopping CDMA system **8L**

UNIT V: SATELLITE MOBILE AND SPECIALIZED SERVICES:

Satellite Mobile Services: Satellite Mobile Services , Radar-sat , Global Positioning System , Orbcomm, Satellite telephony, Satellite television, Satellite radio, satellite Data Communication Services.

Specialized Services: Weather forecasting satellites, navigation Satellites, Military communication Satellites, EDUSAT systems, Telemedicine. **8L**

Text Books:

1.Dennis Roddy, Satellite Communications, McGraw Hill , 3rd Edition 2001

Reference Books:

1. M.Richharia- Satellite Communication Systems, Mc Graw Hill, 2nd Edition
2. Timothy Pratt,CharlesBostian& Jeremy Allnutt, Satellite Communications, John Wiley & Sons, 2nd Edition,2006
3. R.N.Mutagi-, Satellite Communications- Principles and Applications, Oxford University Press, Ist Edition 2016

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- Basic satellite system and it's functioning
- Orbital dynamics and satellite launching mechanism
- Functioning of Space segment and Earth Station
- Satellite link design equations
- Latest applications of services provided by satellite systems

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC475	Subject Title	SPREAD SPECTRUM SYSTEM						
LTP	3 0 0	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VIII

Objectives:

- To introduce the spread spectrum and its basic applications in communication,
- To provide students with an exposure to the specialized theory, technology, and applications of spread spectrum systems.
- To provide a concept level introduction to the principles of spread spectrum systems
- To motivate and illustrate applications in commercial systems.

UNIT I Introduction:

Introduction to spread spectrum, origin of spread spectrum systems, different types of spread spectrum techniques, direct sequence system, frequency hopping systems, hybrid systems, Process gain factor for hybrid spread spectrum systems. **8L**

UNIT II Coding for Communication and Ranging:

Property of codes for spread spectrum, maximal length sequences and their properties Autocorrelation and cross correlation of codes, composite codes(Gold code sequences) and their generation, mirrored and non-mirrored sequences ,analysis of PN sequences with respect to correlation bound. **8L**

UNIT III Modulation and Demodulation:

Balance modulator, quadric-phase modulator, frequency synthesis for spread spectrum modulation, in line and heterodyne correlation, base band recovery, phase lock loop, COSTAS loop, FM feedback, PDM and FH demodulators. **8L**

UNIT IV Need for Synchronization:

Need for synchronization, types of synchronizers, RF link- Noise figure, co-channel users, dynamic range and AGC, propagation medium, **7L**

UNIT V Test and Evaluation of Spread Spectrum System:

Testing and evaluation of spread spectrum parameters as Selectivity, sensitivity, jamming margin, synch acquisition, processing gain. Transmitter measurements, cross correlation, synch acquisition **8L**

Text Books:

1. R. C. Dixon, “Spread Spectrum Systems with Commercial Application”, John Wiley, 3rd Ed.

Reference Books:

1. H. Taube and D. L. Schilling, “Principles of Communication Systems”, Tata McGraw Hill, 2nd Ed. Reprint 2007

Outcomes of the Course:

The course provides an understanding of:

- Defining of spread spectrum parameters.
- Principle concept of PN sequences and their generation.
- Application of spread spectrum systems in current communication technologies.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC477	Subject Title	OPTICAL NETWORK						
LTP	3 0 0	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VIII

Objectives:

- Define the main possibilities and limitations of optical network technologies
- Identify and illustrate the main differences between optical networking and traditional networking
- Solve simple WDM network design and optimization problems
- Assess the concept and analyse/compare the benefits of various optical layer survivability strategies
- Identify, illustrate, and compare the main issues in management and control of optical networks

UNIT I: Introduction and Components:

Light propagation in optical fibers-Loss & bandwidth, Services, Circuit Switching, Packet Switching, Optical Networks, Optical Layer, Transparency and All Optical Networks. Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers- Erbium Doped Fiber amplifiers, Raman amplifiers, Semiconductor optical Amplifiers, Cross talk in SOAs., Switches, Wavelength Converters. **10L**

UNIT II: Optical Network Architectures:

Introduction to Optical Networks; SONET / SDH, Metropolitan-Area Networks, Layered Architecture ; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Test beds for Broadcast & Select WDM; Wavelength Routing Architecture. **8L**

UNIT III: Network and Design:

SONET/SDH- Multiplexing, SONET/ SDH Layers, Frame Structure, Frame Structure, Physical Layer, Elements of a SONET/SDH Infrastructure. ATM - Functions of ATM, Adaptation Layers, Quality of Service, Flow Control, Signaling and Routing. WDM Network Elements. **6L**

UNIT IV: Transmission System Engineering:

System Model, Power Penalty, Transmitter, Receiver, Optical Amplifiers, Cross talk, Dispersion, Fiber Nonlinearities, Wavelength Stabilization .Design of Soliton Systems, Design of Dispersion–Managed Soliton Systems **6L**

UNIT V: WDM Network Design and Management:

Optical Line Terminals, Optical Line Amplifiers, Optical Add/Drop Multiplexers, Optical Cross connects. Cost Trade Offs, wavelength assignment problems, ,LTD and RWA Problems, Dimensioning Wavelength-Routing Networks, Overall design considerations; Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface. **9L**

Text Books:

1. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks : A Practical Perspective”, Harcourt Asia Pte Ltd., Second Edition

Reference Books:

1. C. Siva Ram Moorthy and Mohan Gurusamy, “WDM Optical Networks : Concept, Design and Algorithms”, Prentice Hall of India,

2. P.E. Green, Jr., “Fiber Optic Networks”, Prentice Hall,

OUTCOMES OF THE COURSE:

After learning the course the students should be able to

- Understand the concept of optical networking components and architectures.
- Gain wide knowledge of Optical Networks and applications.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC478	Subject Title	PLC, DCS and SCADA						
LTP	3 0 0	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VIII

Objectives of the Course:

- To acquaint the students with Industrial PLC & DCS systems.
- To familiarize the students with basic PLC programming.
- To acquaint the students with Reliability & Redundancy concepts.
- To acquaint the students with basic communication protocols of Industrial PLC & DCS systems.

UNIT I: Fundamentals of PLCs:

PLC Fundamentals, Discrete state Vs continuous state control, Building blocks of PLCs, PLC advantages & Disadvantages, Communication in PLCs, Types of PLCs, PLC Applications, Comparative study of industrial PLCs.

8L

UNIT II: PLC Functionality & Programming:

Programming methods- Relay & logic ladder diagrams, Boolean Logic, High Level Languages.

Basic PLC Programming – Programming ON/OFF inputs to produce ON/OFF outputs, Relation of Digital Gate Logic to Contact/Coil Logic, Creating Ladder Diagrams from Process Control Descriptions.

Basic PLC Functions – Register Basics, Timer Functions, Counter Functions.

Intermediate PLC Functions – Arithmetic Functions, Number Comparison Functions **8L**

UNIT III: DCS:

Evolution of DCS, Elements of DCS, Building blocks of DCS, Detailed descriptions and functions of field control units, Operator stations and data highways, Comparative study of industrial DCS, Case studies in DCS.

8L

UNIT IV: Reliability& Redundancy Concepts:

Reliability, Reliability calculations, intrinsically safe instrumentation, Redundancy Concepts. **6L**

UNIT V: Communication in DCS:

Basics of Computer Networks, Special Requirements of Network used for control, Communication protocols, Communication in DCS, Link Access Mechanism, Manufacturer Automation Protocols, Field Bus and Smart Transmitters.

8L

Text Books:

1. Moore, Digital Control Device, ISA Press, 1986.

Reference Books:

1. Huges T, Programmable Logic Controllers, ISA Press, 1994
2. John W. Webb, Ronald A. Reis, Programmable Logic Controllers Principles and Applications, PHI 5th Edition, 2005
3. Tanaenbaum AS, Computer Networks, Prentice Hall, 1998.
4. Luckas MP, Distributed Control Systems, Van Nostrand Reinhold co., Newyork, 1986

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- Basic understanding of PLCs and their industrial usage.
- Fundamental Programming using Ladder logic programming.
- Basic understanding of DCS and their industrial usage.
- Basic understanding of Reliability & Redundancy.
- Basic understanding of Communication Protocols used by PLC & DCS systems.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EC479	Subject Title	LATEST TRENDS IN COMMUNICATION						
LTP	3 0 0	Credit	3.0	Subject Category	Elective	Year	4th	Semester	VIII

Objectives of the Course:

- To introduce the students to Latest trends in Communication.
- To understand the wireless communication systems and standards.
- To understand the OFDM and MIMO systems.
- To understand the wireless networks.

UNIT I: Software Defined Radios and Cognitive radios:

Software defined radio: Concept of SDR, Hardware/Software architecture of SDR.

Cognitive radio: Definition, spectrum sensing, spectrum management, computational intelligence, architecture and radio resource management, Dynamic Spectrum Access. **8L**

UNIT II: Wireless Communication System and Standards:

Broadcast networks-DAB, DVB, DTH, Infrastructure based cellular networks- GSM, GPRS, EDGE, CDMA based cellular standards, WLL, IMT-2000, 3G and beyond- HSDPA, HSUPA, HSPA, LTE, LTE-A. **8L**

UNIT III: OFDM and MIMO Systems:

Basis principles of orthogonality,Single vs Multicarrier systems, OFDM Block diagram, Mathematical representation of OFDM signal, Advantages and disadvantages of OFDM systems, other variants of OFDM.

MIMO Systems: Space diversity and systems based on space diversity, MIMO based system architecture, Antenna considerations for MIMO, MIMO channel modelling, measurement and MIMO capacity; Smart antennas.

8L

UNIT IV: WLAN, WMAN and Ad Hoc networks:

Mobile ad hoc and wireless sensor networks, adaptive link, MAC and network layer, energy efficiency and cross-layer design. Bluetooth, Wi-Fi standards, WiMAX standards, Wireless Sensor Networks, IEEE802.15.4 and Zigbee, Introduction to BWA, UWB. **8L**

UNIT V: WIRELESS NETWORK CAPACITY AND ARCHITECTURE:

Wireless capacity and channel state estimation, network capacity, information theory and network architecture.

7L

Text Books:

1. KE-LIN-DU , M.N.S. Swamy. Wireless Communication systems, Cambridge University Press. 1st edition.

Reference Books:

1. Paulraj, A., Nabar, R. and Gore, G., "Introduction to Space-Time Wireless Communications", Cambridge University Press. 2003

2. UpenaDalal, Wireless Communication , Oxford University Press, 1st edition 2009**.**

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- SDR and Cognitive radio.
- Wireless system and standards
- OFDM and MIMO systems and Wireless network capacity and architecture.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS457	Subject Title	SOFT COMPUTING *(Departmental Elective 8/9)*						
LTP	2 0 2	Credit	3	Subject Category	DE	Year	4th	Semester	VIII

OBJECTIVES:

Students undergoing this course are exposed to learn an overall knowledge of soft computing theories and fundamentals & understanding on the fundamentals of non-traditional technologies and approaches to solving hard real-world problems

Unit I : (8 L)

Introduction of Soft Computing: Introduction to soft computing techniques, Basic concepts of fuzzy logic, artificial neural networks, Genetic algorithm and probabilistic reasoning, application areas of soft computing techniques. **Artificial Neural Networks:** Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Backpropagation networks - Kohnen's self-organizing networks - Hopfield network.

Unit II : (9 L)

Fuzzy Systems: Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions.
Decomposition – Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.
Neuro - Fuzzy Modeling: Adaptive networks based Fuzzy interface systems - Classification and Regression Trees – Data clustering algorithms - Rule based structure identification - Neuro- Fuzzy controls – Simulated annealing – Evolutionary computation.

UNIT III : (9 L)

Application of Soft Computing: Optimization of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques.

LEARNING OUTCOMES

Upon the successful completion of the course, Students will be able to

CO1.Discuss about the use of neural network and its architecture.
CO2. Understanding the application of Soft Computing
CO3. Will understand the MATLAB setup for soft computing.

Text Book:

1. Sivanandam, Deepa, " Principles of Soft Computing", Wiley,2nd edition 2011
2. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall,1997
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill,3rd edition 2010
4. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall,1st edition 1993.
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley,1989.

Reference Book:

1. Hongxing Li, C.L. Philip Chen and Han Pang Huang, Fuzzy Neural Intelligent Systems, Prentice-Hall (1997).
2. Haykin Simon, Neural Networks and Learning Machines, Imperial College Press (2007).
3. Goldberg, David E. Genetic Algorithms in Search, Optimization, and Machine Learning, Pearson Education (2007).
4. Rosen, Kenneth H. Discrete Mathematics and its Applications, Tata Mcgraw-Hill (2003)

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS443	Subject Title	LAMP Technologies *(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 to design and develop dynamic, database-driven web applications using PHP version 5. Students will learn how to connect to any ODBC-compliant database, and perform hands on practice with a MySQL database to create database-driven HTML forms and reports etc. Students also learn how to configure PHP and Apache Web Server. Comprehensive lab exercises provide facilitated hands on practice crucial to develop competence web sites.

Unit I: (9 L)

Introduction to Lamp, Linux operating system, Apache web server, Mysql database server, PHP scripting, purpose of using Lamp, Lamp versus other solutions; installing linux, choosing the correct linux, hardware requirements, installing fedora, pre-installation, type of installation, hard disk partitioning, boot loader selection, network configuration, firewall configuration, package selection, package installation, bootable disk creation, post installation setup.

Unit II (8 L)

Booting linux, initialization scripts, rc scripts, run level scripts, login process, exploring linux shell, understanding bash, understanding linux filesystem: /bin, /boot, /dev, /etc, /home, /lib, /lost+found, /mnt, /opt, /proc, /root, /sbin, /tmp, /usr, /var; managing users and groups, /etc/passwd, /etc/group, linux passwords, user administration, group administration, modifying users or groups, managing services, creating disk quotas, starting and stopping system services, controlling access to services, managing software, source tarballs, source code vs binary packages, RPM and RPM source packages, performing system backup and recovery, critical data, backup media, backing up your system, system restoration.

Unit III (9 L)

Apache web server, apache 1.3 vs apache 2.0, new features of apache 2.0, module enhancements, apache 1.3 features, apache 1.3 modules, installing apache web server, removing apache web server RPMs, apache installation methods, apache directories, apache programs, understanding *httpd.conf* file, apache virtual host, enabling directory listings, password protecting web directories, configuring *cgi-bin* directories, using *.htaccess* file for configuration; understanding mysql, flat file vs relational databases, advantages and limitations of mysql, mysql versions, installing mysql, common configuration directives, mysql server and client, editing configuration files, enhancing security, mysql administration, performance and replication. purpose of PHP, PHP versions, installing PHP, configuration options and extensions, compiling and installing PHP, apache configuration to handle PHP, PHP INI file.

Purpose of PHP, PHP versions, installing PHP, configuration options and extensions, compiling and installing PHP, apache configuration to handle PHP, PHP INI file; setting up apache virtual host, preparing mysql database, testing apache, PHP and mysql, scripting database connection, scripting data insertion, scripting data extraction and formatting.

LEARNING OUTCOMES

After the completion of course, students will get hands on experience on

CO1. Uses of Linux & MySQL.

CO2. Understanding & working of Apache Web server

CO3. Understanding of PHP & its uses in web development.

Text Book:

1. James Lee, Brent Ware*, Open Source Development with LAMP,* Addison-Wesley Professional, 2002.

Reference Book:

1. Jason Gerner, Elizabeth Naramore*, Professional LAMP,* John Wiley & Sons., 2005.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

---

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS473	Subject Title	Computer Vision *(Departmental Elective 8/9)*					
LTP	2 0 2	**Credit**	3	**Subject Category**	DE	**Year**	4th	**Semester**	VIII

OBJECTIVES:

The objectives of this course is to get the exposure to students about computer vision and its application in image analysis.

Unit I (8 L)

Introduction: What is computer vision, The Marr paradigm and scene reconstruction, Other paradigms for image analysis. Image Formation, Image Geometry, Radiometry, Digitization.

Unit II (9 L)

Binary Image Analysis and Segmentation: Properties, Digital Geometry, Segmentation.
Image Processing for Feature Detection and Image Synthesis, Edge detection, corner detection Line and curve detection, SIFT operator, Image-based modelling and rendering, Mosaics, snakes.

Unit III (9 L)

Stereo: Shape from shading, Photometric stereo, Texture, Occluding contour detection, Motion Analysis: Motion detection and optical flow Structure from motion

---

LEARNING OUTCOMES

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

CO 1. Implement fundamental image processing techniques required for computer vision .
CO2. Perform shape analysis
CO3. Implement boundary tracking techniques
CO4. Apply chain codes and other region descriptors
CO5. Implement motion related techniques. CO6: Develop applications using computer vision techniques.

Text Book:

1. D. Forsyth and J. Ponce, *Computer Vision - A modern approach*, Prentice Hall *Robot Vision*, by B. K. P. Horn, McGraw-Hill,2nd edition ,2015

Reference Book:

1. E. Trucco and A. Verri *,Introductory Techniques for 3D Computer Vision*, Publisher: Prentice Hall,1998

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	CS474	Subject Title	Object Oriented Modeling & Design *(Departmental Elective 8/9)*						
LTP	2 0 2	**Credit**	3	**Subject Category**	DE	**Year**	4th	**Semester**	VIII

OBJECTIVES:

The objective of the course is to make proficient students in the area of software modelling & design using object oriented concepts.

Unit-1 (9 L)

Introduction to Object Oriented Modelling

Object Oriented Modeling**,** Characteristics Object Oriented Modeling**,** Class and Objects Links and Association, Generalization and Inheritance**,** An Object Model**,** Benefits of OO Modeling, Introduction to OOAD tools

Unit-2 (8 L)

UML and object oriented Design

UML: Introduction, Object Model Notations: Basic Concepts, Structural Diagrams, Behavioral Diagrams, Modeling with Objects.

Object Oriented Design

System Design: System Design: An Object Oriented Approach, Breaking into Subsystems, Concurrency Identification, Management of data store, controlling events between Objects, Handling Boundary Conditions.

Object Design

Object Design for Processing, Object Design Steps, Designing a Solution, Choosing Algorithms, Choosing Data Structures, Defining Classes and delegation of Responsibilities to Methods.

Unit-3 (9 L)

Object Modelling

Advance Modeling Concepts: Aggregation, Abstract Class, Multiple Inheritance, Generalization as an Extension, Generalization as a Restriction, Metadata, Constraints, An Object Model

Dynamic Modelling

Events, State and State Diagram, Elements of State Diagrams, Examples of State Diagrams
Advance Concepts in Dynamic Modeling, Concurrency, A Dynamic model

Functional Modeling

Functional Models, Data Flow Diagrams, Features of a DFD, Design flaws in DFD
A Functional model, Relationship between Object, Dynamic, and Functional Models

LEARNING OUTCOMES

At the end of the course the 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.

Text Book:

1- Bennett, Simon ; Skelton, John; Lunn, Ken, Schuam's Outline of UML. 2nd Edition, New York: McGraw-Hill, 2001.

Reference Book:

1-Stevens, Perdita, Using UML: Software Engineering with Objects andComponents, 2nd Edition, Harlow, England: Addison-Wesley, 2000.

2- Satzinger, John &Orvik, Tore U. The Object-Oriented Approach: Concepts,System Development, and Modeling with UML, 2nd Edition, Australia: Course Technology, 2001

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	IT461	Subject Title	Distributed System						
LTP	2 0 2	Credit	3	Subject Category	DE	Year	4th	Semester	8th

Course Objective:

The objective of the course is to make the students to understand the concept of distributed systems. The students are also capable of understanding the client-server model in remote environment.

Detailed Syllabus

UNIT 1

Introduction to Distributed Systems: Introduction, Examples of distributed Systems, System Models: Architectural models, Fundamental Models, Distributed Computing architecture, Difference between Distributed O. S. and Network O. S., Issues with Distributed Systems, Message passing in distributed systems, **Theoretical Foundation for Distributed System:** Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination detection.

(10 L)

UNIT 2

Distributed Mutual Exclusion: Requirement of mutual exclusion and its theorem, Token based and non-token based algorithms, performance metric for distributed mutual exclusion algorithms.
Distributed Deadlock Detection: system model, resource Vs communication deadlocks deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.
Distributed File Systems: File service architecture, Sun Network File System, The Andrew File System, Recent advances, Distributed Shared Memory.

(8 L)

UNIT 3
Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications.
Transactions and Concurrency Control: Flat and nested distributed transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control,Replication: Fault - tolerant services, highly available services, Atomic Commit protocols, Basics of grid Computing and Cloud computing.

(8 L)

Learning Outcome

At the end of the course The student will have the knowledge of:
1. Benefits and limitation of Distributed System
2. Deadlocks prevention & detection in Distributed System.
3. Transaction and concurrency control in distributed systems
4. Relation between distributed, grid and cloud computing

Text book [TB]:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill

2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Ed.

3. Michael Miller," Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Pearson Ed.

4. Udit Agarwal, "Distributed Computing", Katson Publications

Reference books [RB]:

2. Gerald Tel, "Distributed Algorithms", Cambridge University Press

3. Tannenbaum, A. Distributed Operating Systems, Pearson Education. 2006

.

List of Practical's

EXPERIMENT-1 Implement concurrent echo client-server application
EXPERIMENT-2 Implement concurrent day-time client-server application.
EXPERIMENT-3 Configure following options on server socket and tests them: SO_KEEPALIVE, SO_LINGER, SO_SNDBUF, SO_RCVBUF, TCP_NODELAY
EXPERIMENT-4 Incrementing a counter in shared memory.
EXPERIMENT-5 Create CORBA based server-client application
EXPERIMENT-6 Design XML Schema and XML instance document
EXPERIMENT-7 WSDL based: Implement Arithmetic Service that implements add, and subtract operations / Java based: Implement Trigonometric Service that implements sin, and cos operations.
EXPERIMENT-8 Configuring reliability and security options
EXPERIMENT-9 Monitor SOAP request and response packets. Analyze parts of it and compare them with the operations (java functions) headers.
EXPERIMENT-10 Design and test BPEL module that composes Arithmetic Service and Trigonometric Service.
EXPERIMENT-11 Test open source ESB using web service. LABWORK BEYOND CURRICULA
EXPERIMENT-12 Implementing Publish/Subscribe Paradigm using Web Services, ESB and JMS
EXPERIMENT-13 Implementing Stateful grid services using Globus WS-Core-4.0.3

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	IT453	Subject Title	Introduction to Remote Sensing & GIS						
LTP	3 0 0	Credit	3	Subject Category	DE	Year	4th	Semester	7th

Course Outline: To provide a detailed idea on Geographical Information System, how to maintain GIS database. The concept of architectural view, services & application aspects.

Course Objective:

1. Apply principles of remote sensing and GIS to collect, map and retrieve spatial information.
2. Plan, assess and evaluate natural and manmade systems using geospatial models and methods.
3. Use geospatial tools and techniques for hazard mitigation and resource planning.
4. Pursue research and develop capabilities to handle multi-disciplinary field projects.
5. Work in teams and demonstrate leadership skills with professional ethics.

Course Pre/Co- requisite (if any): Sensor Networks

Detailed Syllabus

UNIT 1: Remote Sensing: **(08 Lectures)**

Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, energy resources, energy interactions with earth surface features and atmospheres, spatial temporal , spectral and radiometric resolution of satellite sensors and satellite visual interpretation techniques.

UNIT 2: Geographical Information System: **(06 Lectures)**

Introduction, GIS definition and terminology, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

GIS database: spatial and attribute data; conceptual models of spatial information, Raster and Vector data. Representation of geographic information: point, line and area features and topology.

UNIT 3:Geospatial database: **(10 Lectures)**

Raster to Vector data conversion, map projection, Remote sensing data as an input to GIS data. GIS functionality. Object–relational databases; data storage and data retrieval through query.

Overlay: arithmetical, logical and conditional overlay, buffer analysis.

UNIT 4: Architecture & Services: **(08 Lectures)**

Web-GIS architecture, mapping server (GeoServer and MapServer), OGC standard services WMS, WFS, WFS-T, WCS, WPS.

UNIT 5:Applications & analysis: **(08 Lectures)**

Applications of GIS, Terrain Mapping and analysis: DEM, TIN, contouring and vertical profiling, Viewshed analysis.

Path Analysis and Network: Shortest path, closest facility, location allocation.

Learning Outcome

- Identify specific data and methodologies for effective mapping and evaluation of natural resources
- Develop geospatial models and tools to address the social and engineering problems
- Apply geospatial technologies for hazard mitigation and management
- Design multi-criteria geospatial systems for decision making process
- Work in a team using geospatial tools and environment to achieve project objectives
- Pursue lifelong learning for professional advancement.

Text book [TB]:

1. Lillesand, T.M., and Kieffer, R.M., 2013: Remote Sensing and Image Interpretation, John Wiley.
2. Jensen, J.R. 2014: Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall.
3. Introduction to GIS: Kang –Tsung –Chang, TMH International, 2000.

Reference books [RB]:

1. Fundamentals of Spatial Information Systems by Robert laurini and Derek Thompson, Academic Press.
2. Geographical Information Systems, Vo. I and II edited by Paul Longely, M.F. Goodchild, et.al, John Wiley and Sons, Inc. 2015.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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]:

3. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
4. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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:

5. Understand the fundamentals of wireless networks.
6. Understand and evaluate emerging wireless technologies and standards
7. To explore mobile security issues
8. 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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

Subject Code	EE485	Subject Title	BASIC INSTRUMENTATION AND PROCESS CONTROL						
LTP	3 0 0	Credit		Subject Category	Open Elective	Year	4th	Semester	VIII

Objectives of the Course

- To make students understand the construction, working principle and application of various transducers used for flow measurement, strain measurement, pressure and vacuum measurement,
- force, torque and power measurement
- To develop an understanding about the different types of telemetry systems used and types of instruments required for display and recording of the data to be transmitted
- Understand about components, characteristics of various control processes used and their modes of operation.

Unit 1	**Transducer – I :** Definition, advantages of electrical transducers, classification, characteristics, factors affecting the choice of transducers, Potentiometers, Strain guages, Resistance thermometer, Thermistors, Thermocouples, LVDT,RVDT	**8L**
Unit 2	**Transducer – II: Capacitive**, Piezoelectric Hall effect and opto electronic transducers. Measurement of Motion, Force pressure, temperature, flow and liquid level.	**8L**
Unit 3	**Telemetry: General** telemetry system, land line & radio frequency telemetering system, transmission channels and media, receiver & transmitter. Data Acquisition System: Analog data acquisition system, Digital data acquisition system, Modern digital data acquisition system.	**8L**
Unit 4	**Telemetry: General** telemetry system, land line & radio frequency telemetering system, transmission channels and media, receiver & transmitter. Data Acquisition System: Analog data acquisition system, Digital data acquisition system, Modern digital data acquisition system.	**8L**
Unit 5	**Display Devices and Recorders:** Display devices, storage oscilloscope, spectrum analyser, strip chart & x-y recorders, magnetic tape & digital tape recorders. **Process Control:** Principle, elements of process control system, process characteristics, proportional (P), integral (I), Derivative (D), PI, PD and PID control modes. Electronic, Pneumatic & digital controllers.	**8L**

Text Books:

1. A.K.Sawhney, “Advanced Measurements & Instrumentation”, Dhanpat Rai & Sons
2. B.C. Nakra&K.Chaudhry, “Instrumentation, Measurement and Analysis”, Tata Mc Graw Hill 2nd Edition.
3. Curtis Johns, “Process Control Instrumentation Technology”, Prentice Hall

Reference Books

1. E.O. Decblin, “Measurement System – Application & design”, Mc Graw Hill.
2. W.D. Cooper and A.P. Beltried, “Electronics Instrumentation and Measurement Techniques” Prentice Hall International
3. RajendraPrasad,”Electronic Measurement and Instrumentation Khanna Publisher
4. M.M.S. Anand, “Electronic Instruments and Instrumentation Technology” PHI Learning.

Outcome of the Course:

- **Identify the appropriate instruments for measurement of different quantities.**
- **Ability to analyze, formulate and select suitable sensor for the given industrial applications**
- **Ability to analyze various control processes used and their modes of operation.**

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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

Syllabus of B.Tech – Electronics & Communication Engineering
Applicable for Batch: 2018-22

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.