DIT UNIVERSITY
Dehradun

Detailed Course Structure
of

B.Tech – Information Technology

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Course Structure

Year: 1st   **Semester: 1st**

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: 2nd**

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 of B.Tech – Information Technology Applicable from 2018-2022 Batch

Year: 2ʳᵈ   **Semester: 3ʳᵈ**

Course Category	Course Code	Course Title	L	T	P	Credit
AC	CH201/HS224	Environmental Science /Indian Constitution	2	0	0	0
DC	CS204	Data base Management System	3	0	2	4
	CS211	Discrete Mathematics	3	1	0	4
	CS212	Computer organization	3	1	0	4
	CS201	Data structure	3	0	2	4
	CS202	Java Programming Concepts	3	0	2	4
EC	EC202	Digital System Design	3	0	2	4
AC	HS201	Aptitude & Soft Skills- 1	2	0	0	0
		Total	20	3	6	24

Year: 2ʳᵈ   **Semester: 4ᵗʰ**

Course Category	Course Code	Course Title	L	T	P	Credit
HE	HS24*	Humanities Elective-1	2	0	0	2
AC	HS244	Indian Constitution	2	0	0	0
SC	MA202	Probability and Statistics	3	1	0	4
DC	CS213	Theory of computation	3	1	0	4
	CS214	Operating System	3	1	0	4
	CS203	Computer Network	3	0	2	4
	CS205	Dot Net Technologies	3	0	2	4
AC	CS221	Introduction to Python (VAT)	0	0	2	0
AC	HS204	Aptitude & Soft Skills- 2	2	0	0	0
		Total	19	3	6	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

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Year: 3rd   **Semester: 5th**

Course Category	Course Code	Course Title	L	T	P	Credit
DC	CS301	Algorithms: Analysis & Design	3	0	2	4
	IT311	Software Engineering	3	0	0	3
	CS 345	Web Technology	3	0	2	4
DE		Department Elective-1	3	0	2	4
		Department Elective-2	3	0	0	3
HE		Humanities Elective-2	2	0	0	2
PRJT	IT301	Study Project	0	0	4	2
ST	IT302	Summer Training Evaluation	0	0	2	0
AC	HS301	Aptitude & Soft Skills- 3	3	0	0	0
		Total				**22**

Department Elective 1

Course Code	Course Title
CS341	Computer Based Numerical and Statistical Techniques
CS342	Linux Administration & Shell Programming
IT342	Expert System
IT343	Introduction to System Software

Department Elective 2

Course Code	Course Title
IT351	E-Business
IT352	Service Oriented Computing
IT353	Basic of Data Science
IT354	Cyber Crime and Computer Forensics
IT355	Statistical learning
IT356	Multimedia

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 of B.Tech – Information Technology Applicable from 2018-2022 Batch

Year: 3rd   **Semester: 6th**

Course Category	Course Code	Course Title	L	T	P	Credit
DC	IT324	Cloud Computing	3	0	2	4
DE		Department Elective-3	3	0	2	4
		Department Elective-4	3	0	2	4
		Department Elective-5	3	0	0	3
PRJT	IT303	Design/LAB Project-I	0	0	10	5
	IT304	Industrial Tour	0	0	0	0
OE		Open Elective -1	3	0	0	3
AC	HS304	Aptitude & Soft Skills- 4	3	0	0	0
		Total				**23**

Department Elective 3

Course Code	Course Title
IT344	Animation Techniques
IT345	R Programming
IT346	Advanced Web Technology

Department Elective 4

Course Code	Course Title
CS368	Machine Learning Using R
CS348	Advanced Computer Network
IT348	Elements of DSP and DIP

Department Elective 5

Course Code	Course Title
IT357	IOT
IT358	Neural Network
IT359	Mobile Computing & Services

Open Elective- 1

Course code	Course Title	L	T	P
AR384	Green Building	3	0	0

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Year: 4th   **Semester: 7th**

Course Category	Course Code	Course Title	L	T	P	Credit
DE		Department Elective-6	3	0	2	4
		Department Elective-7	3	0	0	3
DC	IT411	Big Data Analytics	2	0	2	3
OE		Open Elective-2	3	0	0	3
HE		Humanities Elective-3	2	0	0	2
PRJT	IT401	LAB/Design Project-II	0	0	16	8
UC	ME381	Entrepreneurship & Start Up	2	0	2	3
AC	HS311	Employment Enhancement Program	2	0	0	0
						26

Department Elective 6

Course Code	Course Title
IT441	Deep Learning
CS442	Cryptography and Network Security
IT442	Pattern Recognition

Department Elective 7

Course Code	Course Title
CS453	Parallel Computing
IT453	Introduction to Remote sensing and GIS
IT452	Building Enterprise Application

Humanities Elective 3

Course Code	Course Title
HS481	Application of Psychology
HS484	Intellectual Property Rights
HS482	Human Values
HS492	Indian English Literature

Open Elective- 2

Course code	Course Title	L	T	P
CS481	Software Quality Engineering	3	0	0
EC383	Consumer Electronics	3	0	0
EC385	Analog Electronics	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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Year: 4th   **Semester: 8th**

Course Category	Course Code	Course Title	L	T	P	Credit
IP/THESIS	IT402	Industrial Project/Thesis				16
		or				
DE		Department Elective-8	2	0	2	3
DE		Department Elective-9	2	0	0	2
OE		Open Elective-3	3	0	0	3
OE		Open Elective-4	3	0	0	3
HE		Humanities Elective-4	2	0	0	2
		Total				**13**

Department Elective 8

Course Code	Course Title
IT461	Distributed System
IT462	Computer Vision and Robotics
IT463	Software Project Management

Department Elective 9

Course Code	Course Title
IT471	Knowledge Management
CS456	Business Intelligence
IT472	Coding Theory

Humanities Elective 4

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

Open Elective- 3 and 4

Course code	Course Title	L	T	P
CS482	Human Computer Interaction	3	0	0
EC386	Fundamental of communication & Networks	3	0	0
EC382	Biomedical Instrumentation	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

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Summary of the Credit

Year	Semester	Credit
1	1	19
	2	18.5
2	3	24
	4	22
3	5	22
	6	23
4	7	26
	8	13 / 16
Total		167.5 / 170.5

Category wise classification of the Credit

Category	Credits	No. of Subjects
AC	0	9
DC	54	14
DE	30	9
EC	4	1
HE	8	4
IP/THESIS	16	1
OE	12	4
PRJCT	15	3
SC	4	1
ST	0	1
UC	40.5	11
Grand Total	167.5 / 170.5	58

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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, CO_2), 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. AjoyGhatak, 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.

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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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 StryerLubert. 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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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

Course Structure of B.Tech – Information Technology
Applicable from 2018-2022 Batch

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

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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

COURSE 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 L

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 L

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 L

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 L

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 L

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 L

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

Course Outcome:

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

CO1. Demonstrate depleting nature of Environmental Resources and Ecosystem concepts.

CO2. Able to identify the structure and functioning of natural ecosystems.

CO3. Establish man-wildlife harmonious relationship.

CO4. Adapt to 3R (Reuse, Recovery, Recycle).Identify the causes and control measures related to Pollutions.

CO 5. Illustrate and analyse various Case Studies related to Environmental issues and Env. Legislation.

TEXT BOOKS

1. BharuchaErach, 2004. Textbook for Environmental Studies, University Grants Commission, New Delhi.

2. Kaushik A & Kaushik C P. 2007. Perspectives in Environmental Studies, New Age International Publ.

3. S. Deswal& A. Deswal 2015.A Basic Course in Environmental Studies.Dhanpat Rai & Co.

REFERENCES

1. Miller T.G. Jr. 2002. Environmental Science, Wadsworth Publishing Co. (TB).

2. De A.K.,1996. Environmental Chemistry, Wiley Eastern Ltd.

3. Sharma, P.D. 2005. Ecology and environment, Rastogi Publication.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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

COURSE OBJECTIVE

To familiarize the students with the features of the Indian Constitution

To provide a knowledge of their constitutional rights

Unit 1   Introduction 5 L

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 L**

Unit 2 Union Government and its Administration 6 L

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

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

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

Unit 3   State Government and its Administration 3 L

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

Unit-4 Local Administration 7 L

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

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

Unit V: Election Commission 5 L

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.

LEARNING OUTCOME:

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

TEXT BOOKS

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

REFERENCE BOOKS

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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

COURSE 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.

Detailed Syllabus

UNIT I: Introduction to Sets, Relations & Functions   **(7 L)**
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: Posets& Introduction to Boolean algebra   **(6 L)**
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 L)**
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 L)**
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 L)**
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:
1. An ability to perform operations on discrete structures such as sets, functions, relations, and sequences..
2. An ability to construct proofs using direct proof, proof by contradiction, proof by cases, and mathematical induction.
3. An ability to demonstrate the ability to solve problems using counting techniques and combinatorics in the context of discrete probability.
4. An ability to solve problems involving recurrence relations and generating functions.
5. An ability to prove computational theorem

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Text Books:

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

Reference Books:

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	CS212	Subject Title	Computer Organization						
LTP	3 1 0	**Credit**	4	**Subject Category**	DC	**Year**	2nd	**Semester**	3rd

COURSE OBJECTIVE:

This course will facilitate the students to learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design.

Detailed Syllabus

Unit 1: Introduction to Register Transfer and Micro operation& Computer Arithmetic   (8 L)
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.

Unit 2: Processor Organization & Control Design.   (8 L)
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.

Unit 3 Input-Output Organization   (6 L)
Input-Output Organization: I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory Access, Input-Output processor, Serial Communication.

Unit-4 Memory Organization   (6 L)
Memory Organization: Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of Cache Memory, Virtual Memory, Memory management hardware.
Unit- 5: Parallel Processing & Multiprocessor   (8 L)
Parallel Processing: Flynn's classification, Pipelining- Arithmetic Pipelining, Vector Processing, and Array Processor.
Multiprocessor: Characteristic of Multiprocessor, Interconnection Structure, Inter-processor Arbitration.

COURSE OUTCOME:

At the end of the course, the student can:
1. This will help the students to be familiarized with the hardware components and concepts related to the control design.
2. This also will help the students to be familiarized withaddressing modes, different types of instruction formats, input-output organization.
3. The student will be able to learn the hardware components and concepts related to the memory organization.
4. An ability to will be able to get the theoretical concept of parallel processing and different types of multiprocessor's interconnection structures

TEXT BOOKS
1. Computer System Architecture, M. Mano, Pearson, 3rd Edition 2017.
2. Computer Organization, John P.Hayes, McGraw Hill, 6thEdition.2003.

REFERENCES
1. Computer Organization, Vravice, Zaky&Hamacher (TMH Publication),3rd Edition 2017.
2. Structured Computer Organization, Tannenbaum,6th Edition 2012.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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

COURSE 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 L)
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 L)
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 L)
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 L)
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 L)
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.

LEARNING OUTCOME:

At the end of the course, the student can :
1. 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.
2. 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.
3. Students learn to analyze and compare algorithms for efficiency using Big-O notation.
4. Students implement projects requiring the implementation of the above data structures.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

TEXT BOOKS

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

REFERENCES

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

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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

COURSE OBJECTIVE:

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

Detailed Syllabus

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

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 L)**

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 L)**

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 L)**
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 L)**

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.

LEARNING OUTCOME:

At the end of the course, the student can :
1. Able to learn Identify classes, objects, members of a class and relationships among them needed for a specific problem.
2. Able to learn Java application programs using OOPS principles and proper program structuring.
3. Able to Java programs to implement error handling techniques using exception handling.
4. 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.

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REFERENCES

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

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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

COURSE 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.

Detailed Syllabus

Unit 1: Introduction to Database System   **(8 L)**
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 L)**
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 L)**
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 L)**
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 L)**
Transaction Management: Transaction-concepts, states, ACID property, schedule, serializability of schedules, concurrency control techniques - locking, timestamp, deadlock handling, recovery-log based recovery, shadow paging.

LEARNING OUTCOME:

At the end of the course, the student will able to learn:
1. To work on MySQL database management system.
2. To create database and query the database for information retrieval.
3. 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 3rdEdition.
2. Silberschatz, Korth, Data base System Concepts, McGraw hill, V edition

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

REFERENCES

1. Peter Rob & Carlos Coronel ,Data base Systems design, Implementation, and Management, 7th Edition.
2. ElmasriNavate , Fundamentals of Database Systems, Pearson Education.
3. C.J.Date ,Introduction to Database Systems, Pearson Education

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	EC202	Subject Title	Digital System Design						
LTP	3 0 2	Credit	4	Subject Category	EC	Year	2nd	Semester	III

OBJECTIVE:
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.

COURSE OUTCOME:
At the end of the course, the student can:
CO1. To understand and examine the structure of various number systems and its application in digital design
CO2. Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
CO3. The ability to understand, analyze and design various combinational and sequential circuits.
CO4. To develop skill to build digital circuits.

UNIT I – INTRODUCTION: 10 HRS

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).

UNIT II – COMBINATIONAL LOGIC CIRCUITS: 10 HRS
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.

UNIT III – SEQUENTIAL LOGIC CIRCUITS: 06 HRS
Latches: SR, $\overline{S}\,\overline{R}$ (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.

Unit IV- APPLICATION OF SEQUENTIAL LOGIC CIRCUITS: 08 HRS
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.

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.

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

REFERENCES

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.

SR.NO.	EXPERIMENT NAME
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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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.

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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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; 2ndColour 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 AnushreeSahRawatSavera 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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Humanities Electives I

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

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

Unit 1   **6 Hrs**

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

Unit 2   **6 Hrs**

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

Unit 3   **7 Hrs**

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

Unit 4   **7 Hrs**

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

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

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

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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 MinandBehaviour, McGraw-Hill Education, UK. (2008)

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Humanities Electives I

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

Course Objective

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

Unit 1   5Hrs.

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

Unit 2   5Hrs.

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

Unit 3   7Hrs.

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

Unit 4   9Hrs.

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

COURSE OUTCOME:

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

TEXT BOOKS

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

REFERENCE BOOKS

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Humanities Electives I

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

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

Unit 1 Introduction   **4Hrs.**
Definition of Ethics; Approaches to Ethics: Psychological, Philosophical, Social.

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

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

Unit 3   **8Hrs.**
Ethical Concerns: Work Ethics and Work Values, Business Ethics, Human values in organizations, Self-Awareness: Self Concept: Johari Window, Self and Culture, Self-Knowledge, Self-Esteem

Unit 4   **11Hrs.**
Perceived Self-control, Self-serving bias, Self-presentation, Self-growth: Transactional Analysis and Life Scripts. Self-Development: Character strengths and virtues, Emotional intelligence, Social intelligence, Positive cognitive states and processes (Self-efficacy, Empathy, Gratitude, Compassion, and Forgiveness).

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

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

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	MA202	Subject Title	Probability & Statistics						
LTP	3 1 0	**Credit**	4	**Subject Category**	SC	**Year**	2nd	**Semester**	4th

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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	CS213	Subject Title	Theory of Computation						
LTP	3 1 0	**Credit**	4	**Subject Category**	DC	**Year**	2nd	**Semester**	4th

COURSE OBJECTIVE:

This course will facilitate the students to learn the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability.

Detailed Syllabus

Unit 1: Introduction to Finite Automata. **(8 L)**

Introduction to Mathematical foundation for automata: Mathematical preliminaries, alphabets, strings, languages, states, transition, transition graph, generalized transition graph.

Finite Automata: Deterministic Finite Automata, Non-Deterministic Finite Automata, Non-Deterministic Finite Automata with ϵ transitions, minimization of DFA.

Unit 2: NFA & FA with output **(7 L)**

Conversions and Equivalence: Equivalence between NFA with and without ϵ transitions. NFA to DFA conversion.

Application of FA: Equivalence between two DFA's, Limitations of FSM; Application of finite automata, Finite Automata with output- Moore &Melay machine and its conversion.

Unit 3 Grammars & context Free Language **(8 L)**

Regular Languages: Regular sets; Regular expressions, Arden's theorem, Construction of finite Automata for a given regular expression, Pumping lemma for regular sets. Closure properties of regular sets. Grammar Formalism: right linear and left linear grammars; Equivalence between regular linear grammar and FA.

Context free grammar: Grammar for CFL, Derivation trees, sentential forms. Ambiguity in context free grammars; Normal forms: Chomsky normal form and Greibach normal form; Pumping Lemma for Context Free Languages, Closure property of CFL.

Unit-4 Pushdown Automata **(8 L)**

Push Down Automata: Push down automata, definition; Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence; Equivalence of CFL and PDA; Introduction to DCFL and DPDA

Unit- 5: Turing Machine & Computational Decidability **(8 L)**

Turing Machine: Turing Machine, definition, model, Design of TM, Computable functions Church's hypothesis, Types of Turing machines, Universal Turing Machine, Halting problem.

Properties and Decision problems: Properties of recursive and recursively enumerable languages, unsolvable decision problem, un-decidability of Post correspondence problem, Church Turing Thesis.

COURSE OUTCOME:

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

1. Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.
2. Demonstrate their understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving.
3. Prove the basic results of the Theory of Computation.
4. State and explain the relevance of the Church-Turing thesis.

TEXT BOOKS

1. Hopcroft H.E. and Ullman J. D ,"Introduction to Automata Theory Language and Computation",., Pearson Education.3rd Edition.2008.
2. J. C. Martin, "Introduction to Languages and the Theory of Computation", 3rd edition, Tata McGraw-Hill.2009.
3. K.L.P. Mishra, "Theory of Computer Science", PHI.3rd Edition 2014.

REFERENCES

1. Lewis H.P. &Papadimitrou "Elements of Theory of Computation", C.H. Pearson, PHI.2nd Edition 2011.
2. Michael Sipser " Introduction to the Theory of Computation", Thomson India 2nd Edition(international)2004

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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

COURSE OBJECTIVE:

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

Detailed Syllabus

Unit 1: Introduction to Operating System. (8 L)

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 L)

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 L)

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 L)

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 L)

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 :

1. Learn the general architecture& functioning of computers with operating system.
2. Describe, contrast and compare differing structures for operating systems.
3. Understand and analyze theory and implementation of: processes, resource control (concurrency etc.).
4. 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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	CS203	Subject Title	Computer Networks						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	2nd	Semester	4th

COURSE OBJECTIVE:

The objective of this course is familiarizing the students with the concepts of networking in computers, routing of data packets on the network and protocols followed in the networked computers.

Detailed Syllabus

Unit 1: Introduction to Computer Network (8 L)
Introduction: Motivation, OSI model, Signals and media, Bits over signals, Synchronous communication, Modulation and modems, Bandwidth, Throughput, and noise, Time division and Frequency division multiplexing, Standards, Switching methods, ISDN.

Unit 2: Data Link Protocol (8 L)
Packet Transmission: Multiplexing, Frames, Error correction techniques, LAN/WAN/MAN, Topology, CSMA/CD,LAN protocol, Elementary Data link protocol- Sliding window protocols, Token passing rings, FDDI, IEEE 802.3, 802.5.

Unit 3 Routing algorithms of Data Packets in networked computers (8 L)

Routing Algorithms: Distance-Vector, Link-State, Shortest path computation, Dijkstra's algorithm, Congestion control, WAN technologies including frame relay, X.25, ATM.

Unit-4 Interworking & IP addressing (8 L)
Internetworking: Motivation, Concept, Goals, TCP/IP model, IP addressing with sub netting, Address binding with ARP, IP Datagram, Encapsulation IP fragmentation and reassembly, ICMP,IGMP,TCP.

Unit- 5: Introduction to Network Services (8 L)
Network Services: Electronic mail, File transfer, Access and management, Virtual terminals, Remote procedure call.

LEARNING OUTCOME:

At the end of the course, the student can:

1. An ability to perform Design and simulation of protocol using simulation tool.
2. Ability to create reliable communication using communication model with high quality of service.
3. Able to understand the data Packet Routing in networked computers.
4. Able to understand the protocols followed used in computer networks.

TEXT BOOKS
1. Hopcroft H.E. and Ullman J. D ,"Introduction to Automata Theory Language and Computation",., Pearson Education.3rd Edition.2008.
2. J. C. Martin, "Introduction to Languages and the Theory of Computation", 3rd edition, Tata McGraw-Hill.2009.
3. K.L.P. Mishra, "Theory of Computer Science", PHI.3rd Edition 2014.

REFERENCES
1. Lewis H.P. &Papadimitrou "Elements of Theory of Computation", C.H. Pearson, PHI.2nd Edition 2011.
2. Michael Sipser " Introduction to the Theory of Computation", Thomson India 2nd Edition(international)2004

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

SR.NO.	EXPERIMENT NAME
1	Simulate a network having two communication node using Cisco packet Tracer.
2	Simulate a network having 4 communication nodes with one switch.
3	Simulate a network having Two subnet using 2 switch, one Router and 6 nodes using Cisco packet tracer
4	Simulate a network having Two subnets and two Routers using DTE/ DCE Cable with user defined clock rate.
5	Simulate a network using Star Topology Using Cisco packet Tracer.
6	Simulate a network using Bus Topology Using Cisco packet Tracer.
7	Simulate a network using Ring Topology Using Cisco packet Tracer.
8	Simulate a network using Mesh Topology Using Cisco packet Trace.
9	Create a DHCP server using Cisco packet tracer
10	Implement Intra domain and Inter domain routing Protocol using Cisco Packet Tracer.
11	Implement Bit Stuffing using Turbo C++ Editor.

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

COUSRE 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.

Detailed Syllabus

Unit 1: Introduction to Dot Net (8 L)

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 L)

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 L)

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 L)

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 L)

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.

LEARNING OUTCOME:

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

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

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

3. To develop software in C #.

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

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

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

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	CS221	Subject Title	Introduction to Python(VAT)						
LTP	0 0 2	Credit	0	Subject Category	AC	Year	2nd	Semester	4th

OBJECTIVE:

This course aims to provide the knowledge and understanding to python programming so that students will able to simulate the problems in Python as per their requirements.

SR.NO.	EXPERIMENT NAME
1	Program that prompts the user to enter five words. If the length of any word is less than 6 characters, then it asks the user to enter it again. However, if word is of 6 or more characters, then it displays it on the screen.
2	Program to perform following operations on the strings: zfill(),max(), min(),split(),join(), isidentifier(),strip().
3	Program that encrypts a message by adding a key value to every Character (Caesar Cipher). Hint if key=3, then add 3 to every character
4	Program to sort the list using function.
5	Program to store sparse matrix as dictionary.
6	Program to write a function that reads a file and display the number of words and the number of the vowels in the files.
7	Program that plot the following functions in the range 0 degree to 360 degree in the same figure: sine, cosine, tan, cot.

LEARNING OUTCOME:

On successful completion of this course, student should be able to:
CO1. To have knowledge of the structure and model of the programming in Python.

CO2. Experience with an interpreted Language.

CO3. To build software for real needs.

TEXT BOOKS
1. VamsiKurama, "Python Programming: A Modern Approach" , 1st edition Pearson 2017.

2. ReemaThareja, "Python Programming using problem solving approach", 1st edition ,OxfordUniversity press, 2017.

REFERENCES
1. W.Chun "Core Python Programming," , Prantice Hall 3rd Edition 2012

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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.

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 AnushreeSahRawatSavera 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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	CS301	Subject Title	ALGORITHMS: ANALYSIS & DESIGN						
LTP	3 0 2	Credit	4	Subject Category	DC	Year	3rd	Semester	5th

COUSRE 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

Detailed Syllabus

UNIT-I

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. **(6 L)**

UNIT –II

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, **(8 L)**

UNIT –III

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. **(8 L)**
Amortized analysis

UNIT – IV

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. **(8 L)**

UNIT –V

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 Theorm. **(6 L)**

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

Text Book:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Pvt. Ltd., 20012.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia,2003 3.
3. M.T.Goodrich and R.Tomassia , Algorithm Design: Foundations, Analysis and Internet examples, Johnwiley and sons.

Reference Book:

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.
2. Aho, Ullman and Hopcroft ,Design and Analysis of algorithms, ,Pearson education.
3. Ellis Horowitz, SatrajSahniand Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publications pvt. Ltd.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT311	Subject Title	Software Engineering						
LTP	3 0 0	Credit	3	Subject Category	DC	Year	3rd	Semester	5th

Course Objective:

The Objective of this course is to present the fundamentals of software engineering, describes evaluate project management techniques, explore software measurement techniques and also explore the different phases of software engineering.

Detailed Syllabus

UNIT 1
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. **(7 L)**

UNIT 2
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. **(8 L)**

UNIT 3
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. **(10L)**

UNIT 4
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. **(8 L)**

UNIT 5
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), L T P 3 0 0 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. **(8 L)**

Learning Outcome
Having successfully completed this course, the student will demonstrate:

1: Apply the various design models of software engineering.
2: Develop proper SRS for software quality assurance.
3: Measuring the complexities of software projects at the beginning of design phases.
4: Estimating the cost and budget of projects.
5: Removing the errors and bugs so that re-design of models can be done.

Text book [TB]:
  1. Roger S. Pressman: "Software Engineering A Practitioner's Approach"- Fifth Edition, McGraw Hill.
  2. K. Agarwal: "Software engineering"- New Age International Limited Publishers

Reference books [RB]:
  1. Rod Stephens: "Beginning Software Engineering"-O' Reilly Media.

Course Structure of B.Tech – Information Technology
Applicable from 2018-2022 Batch

Subject Code	CS342	Subject Title	LINUX ADMINISTRATION AND SHELL PROGRAMMING						
LTP	3 0 2	Credit	4	Subject Category	DE	Year	3rd	Semester	5th

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

UNIT I

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.   **(8 L)**

UNIT II

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   **(8 L)**

UNIT III

Connecting to remote machines ,Network routing utilities ,Remote file transfer,OtherInternetrelatedutilities,User Information and Communication, Printercontrol,Email utilities. Server Configuration in Linux environment: Telnet, FTP.   **(7 L)**

UNIT IV

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.
                        (7 L)

UNIT V

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.
                        (8 L)

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.

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"

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	CS341	Subject Title	Computers Based Numerical and Statistical Techniques						
LTP	3 0 2	Credit	4	Subject Category	DE	Year	3rd	Semester	5th

Course Objective:

This course is designed to provide solutions of nonlinear equations in one variable, interpolation and approximation, numerical differentiation and integration, direct methods for solving linear systems, numerical solution of ordinary differential equations.

Detailed Syllabus

Unit I :   (8 L)

Introduction: Numbers and their accuracy, Computer Arithmetic, Errors and their Computation, General error formula, Error in a series approximation.

Solution of Algebraic and Transcendental Equation: Bisection Method, Iteration method, Method of false position, Secant method, Newton-Raphson method, Rate of convergence of Iterative, Newton Raphsion methods.

Unit II :   (8 L)

Interpolation: Finite Differences, Difference tables Polynomial Interpolation**:** Newton's forward and backward formula Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula. Interpolation with unequal intervals: Langrange's Interpolation, Newton Divided difference Formula.

Unit III :   (6 L)

Statistical Computation: Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves, Regression Analysis, Linear and Non linear Regression, Multiple regression.

Unit IV :   (8 L)

Numerical Integration and Differentiation: Introduction, Numerical differentiation Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule.

Unit V: **(6 L)**

Solution of differential Equations: Picards Method, Eulers Method, Taylors Method, Runge-Kutta Methods, Automatic Error Monitoring and Stability of solution.

LEARNING OUTCOMES

CO1.Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.

CO2. Apply numerical methods to obtain approximate solutions to mathematical problems.

CO3. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.

Text Book:

3. PradipNiyogi, "Numerical Analysis and Algorithms", TMH, 1st Edition.
4. Gerald &Whealey, "Applied Numerical Analysis", AW

Reference Book:

1. Grewal B S, "Numerical methods in Engineering and Science", Khanna Publishers, Delhi.

2. Srimamta Pal Numerical Method Principles, analysis and algorithms, (Oxford Higher ed)
3. Rajaraman V, "Computer Oriented Numerical Methods", PHI, 3rd edition.

List of Practicals

SR.NO.	EXPERIMENT NAME
1	Find the root of the Algebraic and Transcendental equations using Bisection method methods.
2	Find the root of the Algebraic and Transcendental equations using Iteration method methods.
3	Find the root of the Algebraic and Transcendental equations using Regula Falsi method.
4	Find the root of the Algebraic and Transcendental equations using Newton Raphson method.
5	Implement Newton's Forward Interpolation formula for given data set.
6	Program to Implement Newton's Backward Method of Interpolation using Input data set.
7	To implement Bessel's Interpolation formula(central difference formula).
8	To implement Newton"s Divided Difference/ Lagrange's Interpolation formula (Unequal Interval).
9	To implement Numerical Integration using Trapezoidal rule.
10	To implement Numerical Integration using Simpson 3/8 rule.
11	To implement Numerical Integration using Simpson 1/3 rule.
12	Program to implement Euler method for differential equation
13	Program to implement Runge-Kutta Method for differential equation

Course Structure of B.Tech – Information Technology
Applicable from 2018-2022 Batch

Subject Code	CS345	Subject Title	WEB TECHNOLOGY						
LTP	3 0 2	**Credit**	4	**Subject Category**	DE	**Year**	3rd	**Semester**	VI

OBJECTIVES: Students undergoing this course are exposed to
- Get introduction about various Scripting Languages.
- Familiar with an up-to-date survey of developments in. Web Technologies.
- To know techniques involved to support real-time Software development.

UNIT 1

(6 L)

Web Essentials: Clients, Servers, and Communication. The Internet - Basic Internet Protocols - The World Wide Web-HTTP request message - response message - Web Clients Web Servers.

Markup Languages: An Introduction to HTML History-Versions-Basic Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms, Pages style sheets-CSS- Core Syntax- Properties-Box Model Normal Flow Box Layout-Other Properties.

UNIT 2   **(8 L)**

Client- Side Programming: The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax - Variables and Data Types – Statements – Operators – Literals – Functions – Objects – Arrays - Built-in Objects - JavaScript Debuggers, Browsers and the DOM.

PHP: Starting to script on server side, Arrays, function and forms, Advance PHP.

UNIT 3   **(8 L)**

Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers-Case Study-Related Technologies, Introduction to JQuery.

UNIT 4   **(8 L)**

Web Services: Introduction to Web Services, UDDI, SOAP, WSDL, Developing and deploying web services. Ajax – Improving web page performance using Ajax, Programming in Ajax.

UNIT 5   **(6 L)**

Web 2.0: Interactive and social web**:** Blogs, wikis, and social networking sites – The technology behind these applications - AJAX, Open APIs.

Web 3.0: Semantic Web, Mashups, RDF, Web based Information Systems, Search engines, Recommender Systems, Web Mining.

LEARNING OUTCOMES

Upon the successful completion of the course, students will be able to-
CO1.Design a basic web site using HTML, XML, XHTML.
CO2. Use client side technology to design web site.
CO3.Recognize and evaluate website organizational structure and design elements.

Text Book:

Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.57

Reference Book:

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
   2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
   3. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
   4. Bates, "Developing Web Applications", Wiley, 2006

Course Structure of B.Tech – Information Technology
Applicable from 2018-2022 Batch

List of Practicals

Sr. No.	EXPERIMENT NAME
1	Create simple HTML page to display introduction of all course of current semester.
2	Create a HTML page for your Resume using CSS
3	Create a web page for enquiry form, apply checks on the form fields using JavaScript.
4	Create a web page for Registration form, switch to the new form of welcome if form is successfully filled.
5	Create a simple web page using PHP.
6	Create a form using PHP and apply checks to the fields.
7	Create a webpage for registration of semester, with all subjects. Save records in a table if records are filled correctly.
8	Create a web page to display records of any student enrolled for current semester.
9	Create a web page to update information of any student enrolled for current semester.
10	Create a web page to delete information of any student, enrolled for current semester.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT342	Subject Title	Expert system						
LTP	3 0 2	Credit	4	Subject Category	DE	Year	3rd	Semester	5th

Course Objective:

The objective of the course is to understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural. Language Processing

Detailed Syllabus

UNIT 1

Introduction: games, robotics, expert systems, AI techniques-search knowledge, abstraction.
Search space control: depth-first, breadth-first search, heuristic search – Hill climbing, best-first search, branch & bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis.

(4 L)

UNIT 2

Introduction to prolog : Syntax and Numeric Function, Basic List Manipulation Functions in prolog, Functions, Predicates and Conditionals, Input, Output and Local Variables, Iteration and Recursion ,building expert system.

(8 L)

UNIT 3

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

(7 L)

UNIT 4

Machine-Learning Paradigms: Introduction. Machine Learning Systems. Supervised and Unsupervised Learning.. Artificial Neural Networks: Introduction, Artificial Neural Networks, Single- Layer Feed-Forward Networks, Multi-Layer Feed-Forward Networks, Radial- Basis Function Networks.

(9 L)

UNIT 5

Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert Systems vs. Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and Tools. Uncertainty Measure – Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks.

(10L)

Learning Outcome
At the end of the courseThe student will have the knowledge of:
1.Understand the various types of Knowledge Representation technique
2. Solve various problems using Expert system.

Text book [TB]:
1. Dan W. Patterson - Introduction to Artificial Intelligence and Expert Systems, PHI, New Delhi, 2006.
2. E. Rich & K. Knight - Artificial Intelligence, 2/e, TMH, New Delhi, 2005

Reference books [RB]:
1. P.H. Winston - Artificial Intelligence, 3/e, Pearson Edition, New Delhi, 2006.
2. D.W. Rolston,- Principles of AI & Expert System Development, TMH, New Delhi

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

<u>**List of Practicals**</u>

SR.NO.	EXPERIMENT NAME
1	Introduction to PROLOG
2	Variables in PROLOG
3	Basic programs in PROLOG
4	Recursion in PROLOG
5	Building Expert system 1 in PROLOG
6	Building Expert system 2 in PROLOG

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT343	Subject Title	Introduction to System Software						
LTP	3 0 2	Credit	4	Subject Category	DE	Year	3rd	Semester	5th

Course Objective:
The objective of the course is to make the students understand concepts of different types of system software, such as – compiler, assembler, loader, microprocessor etc. Apart from theoretical concepts students will study basic programming on 8085 assembly language

Course Pre/Co- requisite (if any) : Computer Organization and Operating System

Detailed Syllabus

UNIT 1
Introduction: System programs and application programs, types of system programs – Operating System, Firmware, translators etc., types of languages – high level, assembly and machine language.
Assemblers: General design procedures, Design of single pass and two pass of assembler.
Macro Processors: Introduction to macro and use of macros, procedure to write macros, Macro processor algorithms - two pass algorithm of macro processor.
(8 L)

UNIT 2

Loader schemes: Introduction to loader, functions of loader, types of loader-Compile and go loaders, absolute loaders, relocating loader, direct linking loader.

Some other concepts: Binder, overlays, dynamic loading, static and dynamic linking.
Compilers: Overview of compilation process, lexical analysis, syntax analysis, semantic analysis and intermediate code generation and code optimization techniques   **(8 L)**

UNIT 3
Microprocessor: Introduction to 8085, CPU architecture-register organization, Pin description and features, different addressing modes and their features   **(9 L)**

UNIT 4
Instruction Set: Instruction set and assembly language programming, Instruction cycle, machine cycle, Timing diagram   **(9 L)**

UNIT 5

Interfacing: Interfacing memory, peripheral chips (IO mapped IO & Memory mapped IO), Interrupts and DMA
(6 L)

Learning Outcome

At the end of the courseThe student will have the knowledge of:
1. Concept of Assembler.
2. Concept of Loader.
3. Concept of compiler.
4. Instructions of microprocessor 8085.
5. Basic assembly language programming

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Text book [TB]:

3. John J Donovan ,"Systems Programming", 10/e, McGraw-Hill Edition ,USA,2010
4. R.S Goankar, "Microprocessor architecture, programming and application with the 8085",5/e, Pen Ram International, India, 2011

Reference books [RB]:

1. Aho and Ulman,"PrinciplesofCompilers",2/e,Narosa Publishing House, India New Delhi,2006.

List of Practicals

Sno	Practical Description
1.	Write a C program to identify whether a given line is a comment or not.
2.	Write a C program to recognize strings under 'a*b+'
3.	Write a C program to test whether a given identifier is valid or not.
4.	Write a C program to simulate lexical analyzer for validating arithmetic operators (+, -, *, /)
5.	Write assembly language code in 8085 for adding two 8 bit numbers.
6.	Write assembly language code in 8085 for subtraction two 8 bit numbers.
7.	Write assembly language code in 8085 for subtraction two 16 bit numbers.
8.	Write assembly language code in 8085 for subtraction two 16 bit numbers.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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**

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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 hour s** 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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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]:

5. QA :Quantitative Aptitude for Competitive Examinations- R.S. Agarwal S. Chand Publications-2017.
   QA: Quantitative Aptitude- Saurabh Rawat and AnushreeSahRawat, Savera Publishing House, 1st Edition-2016.
6. 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.
7. VA :Oxford Guide to English Grammar- John Eastwood, Oxford University Press-2003.
   VA: Fun with grammar- Suzanne W. Woodward Pearson Education ESL-1996
8. Soft Skills :How to Talk to Anyone by Leil Lowndes Harper Element; New edition-2015.
   Soft Skills: Crucial Conversations: Tools for Talking When Stakes Are High by Kerry Patterson, Joseph Grenny, Ron McMillan, and Al Switzler; Brilliance Audio; Abridged, Updated edition-2013.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT351	Subject Title	E-business Applications						
LTP	3 0 0	Credit	3	Subject Category	DE	Year	3rd	Semester	5th

Course Objective:

The objective of this course is to describe the concept of E-business and technologies used for E-Business. The Course will also give an overview of ERP system and SCM.

Detailed Syllabus

UNIT 1
Overview of e-Business, World Wide Web, Overview of Electronics payments, Home Banking, Online Banking.
Customer Relation Management (CRM): Why CRM? Defining CRM, New CRM architecture, CRM trends.
Selling-Chain Management: Deriving forces for Selling-Chain management, Selling-Chain management, Elements of Selling-Chain infrastructure.

(12L)

UNIT 2
Enterprise Resource Planning (ERP): What is ERP? Why ERP? ERP usage in the real World, ERP implementation, Future of ERP applications. **(5 L)**

UNIT 3
Supply Chain Management (SCM): Defining SCM, Basics of Internet-Enabled SCM, e-Supply chain fusion, Manager's roadmap for SCM. **(5 L)**

UNIT 4
E-Procurement: Purchasing versus procurement, Elements of Buy-Side e-Procurement solutions, Elements of Sell-Side e-Procurement solutions, Manager's roadmap for e-Procurement **(5 L)**

UNIT 5
Knowledge-Tone Applications: Why knowledge applications and what is it? **Developing the e-Business Design:** Challenges of e-Business strategy creation, Roadmap to moving your company into e-Business.
Maturity Models: Five Maturity Levels, Characteristics of Maturity Levels, Key process areas.
Overview of E-business proposal, calculating ROI(return on investment). **(13 L)**

Learning Outcome
After completion of this course students will be able to -

1. Describe the concept of E-Business
2. Concept of CRM and selling chain management.
3. Illustrate ERP system and its applications
4. Concept of SCM and E-procurement.

Text book [TB]:
5. Ravi Kalakota and Marcia Robinson; e-Business- Roadmap for Success**;** Addison-Wesley Longman Publishing Co., Inc, 2001
6. H. Albert Napier, Philip J. Judd, Ollie Rivers, Stuart W. Wagner; Creating a Winning E-Business; Thompson, Course Technology; Edition 2 , 2007.

Reference books [RB]:
1. Greenstein and Feinman, "E-Commerce", TMH
2. Ravi Kalakota, Andrew Whinston, "Frontiers of Electronic Commerce", Addision Wesley
3. Denieal Amor, "The E-Business Revolution", Addision Wesley

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT352	Subject Title	SERVICE ORIENTED COMPUTING						
LTP	3 0 0	Credit	3	Subject Category	DE	Year	3rd	Semester	5th

Course Objective:

1. The overall goal of the service oriented computing is to make familiar students with service/software oriented applications.
2. The student will learn how to form attractive service models which will be suitable for industries.

Detailed Syllabus

UNIT 1

Introduction Service-Oriented Architecture: Computing with services, Basic standards for web services, services analysis, design, development and test, Service orchestration and composition, Resource management for web services, Quality and reliability of web services.   **(8 L)**

UNIT 2

Modelling and representation: Modelling to enable interoperation, Integration vs. Interoperation, Common ontologies, Knowledge representations, Elementary algebra: relations, modelling fundamentals Resource description framework: Motivation of RDF, RDF Basics, Key Primitives, XML syntax, Storing RDF.
                                (8 L)

UNIT 3

System Technology: Execution Models: Basic Interaction models, messaging, CORBA, peer to peer computing Security, trust and privacy, QoS and end-to-end performance, Web service standards, Autonomic computing, Service connection technology Grid-based web services.   **(8 L)**

UNIT 4

Service-Oriented Semantic Computing: Semantic web Software agent Service discovery Ontological engineering Service evolutionary approaches, Semantic service selection, Building SOC application, Service Management

                                (8 L)

UNIT 5

Service-Oriented Challenges & Applications: Security, Challenges & Extensions, Application E-business and e-commerce M-commerce E-entertainment E-learning E-government E-health.   **(8 L)**

Learning Outcome

At the end of the course, Learning Outcomes Having successfully completed this course, the student will demonstrate:
1. An ability to cope up with industry projects.
2. Ability to work on live web as well as android project in MNCs.

Text book [TB]:

1. Munindar P. Singh, Michael N Hunns; Service oriented Computing, Wiley 2005.

Reference books [RB]:

1. Huang, J.; Kowalczyk, R.; Maamar; Service-Oriented Computing: Agents, Semantics, and Engineering; Springer 2007.
2. Michael Rosen, Boris Lublinsky, Kevin T. Smith, Marc J. Balcer; Applied Soa: Service-Oriented Architecture And Design Strategies; Wiley India.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT353	Subject Title	Basics of Data Science						
LTP	3 0 0	**Credit**	3	**Subject Category**	DE	**Year**	3rd	**Semester**	5th

Course Objective:

1. The objective of the course is to make the students understand the different techniques for efficient mining of the data.
2. To introduce students to the concepts, processes and practice of Inference Rules at different abstraction levels of Data.
3. To provide an understanding of the Data management perspective regarding the use of business intelligence (BI), Data Mining systems and Advanced Applications.

Detailed Syllabus

UNIT 1
Data Science :Introduction to Data Science, Overview, Motivation, Data Mining-Definition & Functionalities.

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi-Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.   **(12L)**

UNIT 2
Data Pre-Processing: Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Inconsistent Data, Data Integration and Transformation.

Data Reduction: Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

Data objects and attribute types, Measuring Data Similarity and Dissimilarity, Cosine Similarity.   **(7 L)**

UNIT 3
Concept Description: Definition, Data Generalization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Box Plots, Measuring Dispersion of Data, Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases , FP-growth algorithm.

(7 L)

UNIT 4
Classification: What is Classification, Issues regarding Classification, Attribute selection measures, Information Gain, Gain Ratio, Gini Index, Decision tree, Naïve Bayesian Classification, Metrics for evaluating classifier performance, Confusion matrix.   **(6 L)**

UNIT 5
Cluster Analysis: Data types in cluster analysis, Overview of basic clustering methods, Partitioning methods: K-Means and K-medoids technique, Hierarchical Clustering: Agglomerative and Divisive, Density Based Methods :DBSCAN and OPTICS, Grid Based Methods: STING and CLIQUE, Outlier Analysis.   **(8 L)**

Learning Outcome
The course provides the students the ability to:
1 - Undertake systematic investigation/research related to the Data mining Concepts
2- Understand advanced Database systems and technologies for today's dynamic business environment.

Text book [TB]:

1. Jiawei Han, MichelineKamber, "Data Mining Concepts & Techniques" Elsevier.

Reference books [RB]:
1. M.H.Dunham,"DataMining :Introductory and Advanced Topics" Pearson Education
2. Mallach,"Data Warehousing System" ,McGraw –Hill

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT354	Subject Title	Cyber Crime and Computer Forensics						
LTP	3 0 0	Credit	3	Subject Category	DE	Year	3rd	Semester	5th

Course Objective:

The objective of this course is to an understanding of fundaments of computer forensics. The course will give an overview how to analyze various computer forensics technologies, identify computer forensics systems in various situations, identify methods for data recovery and how apply the methods for preservation of digital evidence.

Course Pre/Co- requisite (if any) :

1. Basic knowledge about Computer Networking, Connectivity, Network Protocols, LAN technologies etc.
2. Basic concept about handling database, SQL query, data accessibility etc.
3. Knowledge about Web connectivity, sockets etc.

Detailed Syllabus

UNIT 1
Cybercrime: Definition – History and evolution Types and forms of cybercrimes -Malicious Code - Computer Viruses ,Computer Worms ,Computer Trojans, Web Hacking Foot printing, Port Scanning, E-Shoplifting Web Defacement, Denial of Service Attacks, Manipulating Cookies - Email Hacking: Email Hacking using Packet Sniffers, Email Hacking & Phishing, Email Frauds & Phishing, Email Bombing Email Hijacking - Social Engineering.   **(4 L)**

UNIT 2
Cyber Crime Investigation: Best Practices for Cyber Crime Investigation: Initializing a Search and Seizure Operation Tracking & Tracing Emails, Recovery of Digital Evidence, Cyber Law: Prevention and detection of cybercrime – Cyber Policing Current statutes in India: Penalties & Offences under the Information Technology Act, Offences under the Indian Penal Code, Issues relating to investigation and adjudication of cybercrimes in India Digital evidence IT act 2000 and other legal provisions.   **(10L)**

UNIT 3
Intellectual property rights: Intellectual Property Issues and Cyberspace – The Indian Perspective: Overview of Intellectual Property related Legislation in India, Copyright law & Cyberspace Trademark law & Cyberspace. Digital Delivery of Intellectual Property Services. Forensics: Basic Forensic Principles, Forensic Imaging & Verification, Data Recovery and Analysis. Types of computerforensics i.e. Media Forensics, Network forensics (internet forensics), Machine forensic, Email forensic (e-mail tracing and investigations.   **(15L)**

UNIT 4
Computer Forensics Analysis: Discovery of electronic evidence - electronic document discovery,identification of data- Time keeping, forensic identification and analysis of technical surveillance devices, reconstructing fast events. Network forensics: Setting up the system, advanced networksurveillance. Attackers' goals: ICMP covert channeling, TCP covert channeling, HTTP. Establishing identity in cyberspace: Investigating IP address-MAC address-Tracing E-mails-E-mail address-Usernames-Nicknames and host names   **(5 L)**

UNIT 5
Forensic tools and report generation: Recovery of Deleted files in windows and Unix, Analyzingnetwork traffic, sniffers, Ethical Hacking, Hardware forensic tools like Port scanning and vulnerability assessment tools like Nmap, Netscanetc . Password recovery (tools like John the ripper, L0phtcrack, andTHC-Hydra), Mobile forensic tools and analysis of called data record Template for computer forensicreports. Stages & Steps of Forensic Investigation in Tracking Cyber Criminals, Incident Handling.Foot-printing, Scanning (Types-Port, Network, Vulnerability), E-Mail Spiders, Overview of System Hacking Cycle.   **(6 L)**

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Learning Outcome

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

1. CO1. The definition of computer forensics fundamentals.
2. CO2. Describe the types of computer forensics technology.
3. CO3. Analyze various computer forensics systems.
4. CO4. Understand the methods for data recovery, evidence collection and data seizure.
5. CO5. Summarize duplication and preservation of digital evidence

Text book [TB]:

1. Cyber Crime and Intellectual Property Rights; Harish Chander, PHI, New Delhi, 2016
2. Incident Response & Computer Forensics; Mandia, K. Prosise, C., Pepe, M. 2ndedition. Tata McGrawHill, 2014.

Reference books [RB]:

9. Understanding and managing cyber-crime; New Jersey: Allyn & Bacon, McQuade, Samuel C, 2011
10. Guide to Computer Forensics and Investigations; 2nd edition, Bill Nelson, Amelia Phillips, Frank Enfinger, and Chris Steuart, Thomson Learning, 2016

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT355	Subject Title	Statistical Learning						
LTP	3 0 0	**Credit**	3	**Subject Category**	DE	**Year**	3rd	**Semester**	5th

Course Objective:

Students will formulate complete, concise, and correct mathematical **proofs**.Students will frame problems using multiple mathematical and statistical representations of relevant structures and relationships and **solve** using standard techniques.Students will create quantitative **models**to solve real world problems in appropriate contexts.Students will effectively use professional level **technology** tools to support the study of mathematics and statistics

Detailed Syllabus

UNIT 1

Introduction: Introduction to Regression Models, Dimensionality and Structured Models, Model Selection and Bias-Variance Tradeoff, Classification, and   Introduction to R.   **(4 L)**

UNIT 2

Linear Regression: Simple Linear Regression, Hypothesis Testing and Confidence Intervals, and Linear Regression to R.   **(10L)**

UNIT 3

Classification: Introduction to Classification Problems, Logistic Regression, Multivariate Logistic Regression, Logistic Regression -, and   Classification in R. Resampling: Cross-validation, K-fold Cross-Validation, Resampling in R   **(15L)**

UNIT 4

Introduction and Best-Subset Selection: Stepwise Selection, Backward stepwise selection, Estimating test error, Validation and cross-validation, , Principal Components Regression and Partial Least Squares, and Model Selection in R   **(5 L)**

UNIT 5

Polynomials and Step Functions: Piecewise-Polynomials and Splines, Smoothing Splines, Generalized Additive Models and Local Regression, and Nonlinear Functions in R Tree-based methods, Support Vector Classifier, Feature Expansion and the SVM,Example and Comparison with Logistic Regression, and SVMs in R   **6 L)**

Learning Outcome

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

CO1: Students will summarize data visually and numerically.
CO2: Students will build and assess data-based models.
CO3: Students will learn and apply the tools of formal inference.
CO4: Students will ... the mathematical and probabilistic foundations of statistical inference.
CO5: Students will execute statistical analyses with professional software.

Text book [TB]:

Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani, An Introduction to Statistical Learning with Applications in R, Springer, 2018 (ISBN 978-1-4614-7138-7)

Reference books [RB]:
Trevor Hastie, The Element of Statistical Learning, Springer, 2nd Edition, 2018

Course Structure of B.Tech – Information Technology
Applicable from 2018-2022 Batch

Subject Code	IT356	Subject Title	Multimedia						
LTP	3 0 0	**Credit**	3	**Subject Category**	DE/OE	**Year**	3rd	**Semester**	5th

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Humanities Electives II

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

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

Unit 1 What is positive psychology?   7Hrs.
Introducing Positive Psychology: Definition, goals, assumptions, key concepts and relationships with health psychology, developmental psychology, social psychology and psychology of religion, Meaning and measure of Happiness: Hedonic and Eudemonic perspective, Yogic notion of bliss

Unit 2 Positive Emotions, Cognitive states and Well-being   9Hrs.
What are positive emotions? The broaden and build theory, relevance of positive emotional states for physical, social & psychological resources, Positive emotions and well-being: Happiness and positive behavior, positive emotions and success, resilience, Self-efficacy, Optimism, Hope, Wisdom, Mindfulness and flourishing

Unit 3 How to enhance well-being?   5Hrs.
Use of postures, breathing practices, Sounds, dietary consumption

Unit 4 Positive Psychology at work place   5Hrs.
Maximizing achievement, conflict resolution, gratitude, positive leadership

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

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

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Humanities Electives II

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

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

Unit 1 General Overview of Economics   **6Hrs.**
Nature and Scope of Economics in engineering perspective; **Theory of Demand Analysis:** Meaning and Types, Law of demand, Exceptions to the Law of Demand, Elasticity of Demand; **Theory of Supply Analysis:** Law of Supply and Elasticity of Supply; Mathematical Explanation on cost, revenue and profit function

Unit 2 Production Function and Its Applications   **6Hrs.**
Production Function: Short-run and long-run Production Function; **Mathematical Explanation:** Laws of Returns to Scale & Law of Diminishing Returns Scale; **Concept of Cost and Its Types:** Total cost, fixed cost, variable cost, average variable cost, average fixed cost, marginal cost, explicit and implicit cost; **Break-Even-Analysis:** Importance and graphical presentation, mathematical problems

Unit 3 Time Value of Money and Project Evaluation   **8Hrs.**
Time Value of Money: Simple and Compound, Uniform Series Compound Interest Formula, Present Worth Analysis, Future Worth Analysis, Future Value through Annuity, Rate of Return Analysis, Cash flow diagrams; **Depreciation**: Introduction, Straight Line and Declining Balance Method of Depreciation; **Project Evaluation Techniques:** Present Worth Method, Future Worth Method, Annual Worth Method; Benefit Cost Analysis: Conventional and Modified B/C Ratio with PW method

Unit 4 Banking and Finance   **6 Hrs.**
Banking Sector: Functions of the Commercial Bank and Central Bank, Financial Institutions; **Financial Market:** Money Market and Capital Market; **Monetary and Fiscal Policy:** Objectives, Instruments, Tools in Indian Economy; **Inflation:**Causes, Effects and Methods to Control it, Measurement of Inflation- Consumer Price Index and Whole Price Index; Deflation and Stagflation; **Business Cycles:** Various phases, Control and Measurement, Impact on business cycles on economic activities

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

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

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Humanities Electives II

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

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

Unit 1   **4Hrs.**

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

Unit 2   **7Hrs.**

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

Unit 3   **9Hrs.**

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

Unit 4 TEXT   **6 Hrs.**

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

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

TEXT BOOKS
1. Jerome K Jerome: Three Men on a Bummel (selection), Arrow smith Publications

2. R.K. Narayan: Malgudi Days (selection), I*ndian Thought Publications*

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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:
4. Interpret the questions of aptitude building objectively and prepare for various competitive examinations
5. Understand the optimized approach of dealing with placement questions
6. 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]:
9. Quantitative Ability:How to prepare for Quantitative Aptitude, Arun Sharma, McGraw Hill, 8th edition-2018.
10. Logical Reasoning**:** A Modern Approach to Logical Reasoning-R.S. Aggarwal S Chand Publishing; 2nd Colour edition-2018.
11. Verbal Aptitude: English is Easy- Chetanand Singh, BSC Publication-2018.
12. Soft Skills: The Definitive Book of Body Language by Barbara and Allan Pease; RHUS; 1 edition-2006.

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Reference books [RB]:

9. QA :Quantitative Aptitude for Competitive Examinations- R.S. Agarwal S. Chand Publications-2017.
   QA: Quantitative Aptitude- Saurabh Rawat and AnushreeSahRawat, Savera Publishing House, 1st Edition-2016.
10. 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.
11. VA :Oxford Guide to English Grammar- John Eastwood, Oxford University Press-2003.
    VA: Fun with grammar- Suzanne W. Woodward Pearson Education ESL-1996
12. Soft Skills :How to Talk to Anyone by Leil Lowndes Harper Element; New edition-2015.
    Soft Skills: Crucial Conversations: Tools for Talking When Stakes Are High by Kerry Patterson, Joseph Grenny, Ron McMillan, and Al Switzler; Brilliance Audio; Abridged, Updated edition-2013.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT324	Subject Title	Cloud Computing						
LTP	**3 0 2**	**Credit**	4	**Subject Category**	DC	**Year**	**3rd**	**Semester**	6th

Course Objective:

1. This Course focuses on basic concepts of Cloud Computing and its available services.
2. Students will learn use of cloud services provided by multiple vendors.
3. Course focus on service oriented architecture in place of Traditional IT infrastructure

Detailed Syllabus

UNIT 1
Introduction to Distributed Computing, Cloud Computing definition, NIST Model - essential characteristics, deployment models, service models, Benefits and challenges of cloud computing, Implementation issues, Impact of cloud computing on users, barriers to cloud computing adoption, Cloud computing architecture, Some examples of cloud service providers. **(10L)**

UNIT 2
Pricing models of cloud computing, Concept of Multi-tenancy, types of tenancy, CloudVirtualization technology, (e.g. server, storage, network virtualization), Hypervisors, Types of hypervisors- Xen, VMWare, Hyper-V, KVM. Concept of Virtual Machine, Virtual Machine migration (VM), types of VM Migration.
(8 L)

UNIT 3
Purpose of scheduling, Types of scheduling algorithm – Linear (e.g. - FCFS, SJF etc.) and distributed (e.g. - , Max-Min, Min-Min etc.), Introduction of Cloud Simulator – CloudSim. **(8 L)**

UNIT 4
Cloud Security: Basic idea of data security in the cloud, Aspects of data security in cloud, data security mitigation, provider data and its security, Identity and Access Management – Types of IDMs, IDM standards and Protocols in practice. **(8 L)**

UNIT 5
Enterprise Cloud Computing paradigm – Amazon Ec2, Google App Engine, Microsoft Azure, Salesforce, Just cloud etc. Understanding cloud storage--evaluating on line file storage. Corporation--Evaluating web mail services--Evaluating web conference tools--Evaluating on line groupware-collaborating via blogs and wikis.

(8 L)

Learning Outcome
At the end of the course, Learning Outcomes having successfully completed this course, the student will demonstrate:
1. The students will be able to develop basic understanding of cloud computing, its services (through tools) and deployments models.
2. Ability to provide Infrastructure, Platform and Application as a Service.

Text book [TB]:

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
2. Tim Mathev, Subra Kamaraswamy, Shahed Latif, Cloud Security and Privacy, O'Reilly, Oct 2013.
3. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Reference books [RB]:

1. Anthony T Velte , Robert Elsenpeter Cloud Computing A Practical Approach , Tata McGraw-Hill Education, 01-Jan-2009.
2. Lee Gilliam, Cloud Computing Principles, Systems and Applications, Springer, 2010.
3. RajKumarBuyya, Cloud Computing Principles and Paradigms, John Wiley & Sons, 2015.

List of Practicals

SR.NO.	EXPERIMENT NAME
1	Working on Cloudsim including installation.
2	Design & implementation of one cloud center.
3	Design & implementation of two cloud centers.
4	Implementation of time sharing scheduling.
5	Implementation of Space sharing algorithm.
6	Practice on Google app engine.
7	Storing data on Justcloud or google drive.
8	Create website using google site services.
9	Creating and using shared word, presentations

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT344	Subject Title	Animation Techniques						
LTP	3 0 2	**Credit**	4	**Subject Category**	DE	**Year**	3rd	**Semester**	6th

COURSE OBJECTIVE: The objective of the course is to make the students to understand the concept of graphical primitives and able to make the small animation with these primitives. Students are also capable of writing graphics programs.

Detailed Syllabus

UNIT I

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.

(6 L)

UNIT II

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

(8 L)

UNIT III

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.

(7 L)

UNIT IV

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. Fractals and its Applications.

(10 L)

UNIT V

Introduction to curves: Animation basics - Creating motion - Creating key frames - Representations of animation in the Timeline - Frame rates - Frame-by-frame animation - Onion skinning - Extend still images - Mask layers - Using Timeline effects - Twinned animation - Special effects - Filter - Animation Filters - Create preset filter libraries - Blend modes in Flash - Working with text - Working with sound - Working with video.

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

(9 L)

LEARNING OUTCOMES

At the end of the courseThe student will have the knowledge of:

1.Graphics files.
2.Grahics packages.
3.Graphics programming.
4. Animation creation.
5. Object functions.

Text Book:

1. R.K. Maurya, Computer Graphics, John Willey.
2. David F. Rogers, Procedural Elements of Computer Graphics, Tata McGraw Hill.
3. Cartoon Animation (How to Draw and Paint series) by Preston Blair.

4. The Illusion of Life: Disney Animation by Frank Thomas, Ollie Johnston , Collie Johnston.

Reference Book:

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

List of Practicals

SR.NO.	EXPERIMENT NAME
1	To study the various graphics commands in C language.
2	Develop the DDA Line drawing algorithm using C language
3	Develop the Bresenham's Line drawing algorithm using C language
4	Develop the Bresenham's Circle drawing algorithm using C language
5	Develop the mid point Circle drawing algorithm using C language
6	Develop the C program for flood fill algorithm
7	Develop the C program for boundary fill algorithm
8	Perform the following 2D Transformation operation Translation , Rotation and Scaling
9	Perform the Line Clipping Algorithm
10	Perform the Polygon clipping algorithm
11	Generate a small animation.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT345	Subject Title	R -programming						
LTP	3 0 2	Credit	4	Subject Category	DE	Year	3rd	Semester	6th

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 courseThe 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]:

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

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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)

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

List OfPracticals

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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	CS368	Subject Title	Machine Learning Using R						
LTP	3 0 2	Credit	4	Subject Category	DE	Year	3rd	Semester	VI

Course Objective:

The objective of this course is to develop a broad perspective about the applicability of ML algorithms in different fields and understand the major ML algorithms, the problem settings, and assumptions that underlies them.

Course Pre/Co- requisite (if any) : Basics of Python Programming, concept of statistics

Detailed Syllabus

Unit 1: Introduction to Data Science andMachineLearning (7 L.)

Digital Data – Structured, Unstructured, Semi-structured data, What is Machine Learning? Why Machine Learning? Concept of Learning, Types of Machine Learning: Supervised Machine Learning, Unsupervised Machine Learning, Semi-supervised Machine Learning, Reinforcement Machine Learning, Industrial applications of Machine Learning across domains such as Healthcare, Finance, Retailetc.

Unit II: R Objects:DataHandling (6L.)

Introduction to R, why R? Object, Vector, List, Factor, Matrix, Array, Data Frame, Manipulating Objects, Input/Output, R constructs

UNIT III:DescriptiveStatistics (7 L)

Central tendency – , Dispersion – variance, standard deviation, shape – skewness, kurtosis, percentiles, five point summary, boxplots, histograms, barplot, pie chart, scatter plot, two way tables, covariance, correlation, Chi-Square test for two way tables

Unit IV: Unsupervised Learning-Clustering (9 L.)

What is Clustering? Applications of Clustering, Similarity measures, – K means clustering.

Supervised Learning:Regression,Classification

What is Regression? Simple Linear Regression, Multiple Linear Regression, What is Classification?

Logistic Regression, Decision Tree, k-Nearest Neighbors, Support Vector Machine

Unit V:Neural Networks (10 L.)

Introduction to Neural Networks, Activation functions, Learning rate, Stochastic Gradient Descent, Feed forward, Back propagation, Basics of Deep Learning Networks

Hands-On ProjectsusingR

Data Description, Data Visualization, Correlation analysis, Clustering, Regression, Classification, Neural networks.

LEARNING OUTCOMES
The student will be able to:

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

CO1. Identify the machine learning algorithms which are more appropriate for various types of learning tasks in various domains.
CO2. Implement machine learning algorithms on real datasets.
CO3. To develop the projects using language R

TextBooks:
1. Practical Data Science with R. Author(s): Nina Zumel, John Mount, Manning Shelter Island
2. DataMiningConceptsandTechniques,3rdEdition.Author(s):J.Han,MKamber,JPei

Reference Books:
1.Introduction to Data Mining. Author(s): Pang-Ning Tan, Steinberg, VipinKumar
2.Introduction to Statistical Learning using R. Author(s): Trevor Hastie,Tibshirani

Applied Predictive Modeling. Author(s): by Max Kuhn, KjellJohnson

List of Practicals

SR.NO.	EXPERIMENT NAME
1	Creation of sample dataset and loading of dataset using pandas.
2	Plot scatter plots to see the relations between features, using matplotlib
3	Creation of testing and training datasets using sklearn,
4	Creating a simple linear regression model for house rate prediction
5	Solve a classification problem using logistic regression for a movie dataset.
6	Solve a classification problem using Decision tree for a movie dataset.
7	Solve a classification problem using SVM for a movie dataset
8	Solve a classification problem using neural network for a movie dataset
9	Apply clustering on dataset using K-means

Subject Code	IT348	Subject Title	Elements of DSP and DIP						
LTP	3-0-2	Credit	4	Subject Category	DE	Year	3rd	Semester	6th

Course Objective:

The objective of the course is to make the students to understand the concept of digital image fundamentals, digital signal processing fundamentals, image enhancement, image restoration, image segmentation techniques with wavelet fundamentals, compression and representations.

Detailed Syllabus

UNIT 1

DIGITAL IMAGE FUNDAMENTALS: Introduction, Origin, Steps in Digital Image Processing ,Components , Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization , Relationships between pixels , color models.

Basic elements of DSP: concepts of frequency in Analog and Digital Signals , sampling theorem, Discrete time signals, Analysis of discrete time LTI systems , Z transform , Convolution , Correlation.
        (9 L)

UNIT 2

IMAGE ENHANCEMENT:

Spatial Domain: Gray level transformations ,Histogram processing, Basics of Spatial Filtering, Smoothing and Sharpening , Spatial Filtering

Frequency Domain: Introduction to Fourier Transform, Smoothing and Sharpening frequency domain filters ,Ideal, Butterworth and Gaussian filters. **(9 L)**

UNIT 3

IMAGE RESTORATION AND SEGMENTATION:

Noise models : Mean Filters , Order Statistics , Adaptive filters ,Band reject Filters , Band pass Filters , Notch Filters , Optimum Notch Filtering , Inverse Filtering ,Wiener filtering.

Segmentation: Detection of Discontinuities, Edge Linking and Boundary detection, Region based segmentation;, Morphological processing , erosion and dilation **(9 L)**

UNIT 4

WAVELETS AND IMAGE COMPRESSION:

Wavelets: Subband coding, Multi-resolution expansions.

Compression: Fundamentals, Image Compression models , Error Free Compression. **(8 L)**

UNIT 5

IMAGE REPRESENTATION AND RECOGNITION: Boundary representation, Chain Code, Polygonal approximation, signature, boundary segments, Boundary description , Shape number , Fourier Descriptor

(5 L)

Learning Outcome

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

1. To be familiar with digital image fundamentals and some basic concepts of DSP.
2. To get exposed with simple image enhancement techniques in Spatial and Frequency domain.
3. To get exposed with simple Image restoration and Segmentation techniques.
4. To get familiar with wavelets and image compression methods.
5. To represent image in the form of different features.

Text book [TB]:

5. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.
6. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.

7. Steven Smith. "Digital Signal Processing : A practical guide for Engineers and Scientists ", Newnes Publication , 2002

Reference books [RB]:

1. Willliam K Pratt, "Digital Image Processing", John Willey, 2002.
2. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.

List of Practicals

SR.NO.	EXPERIMENT NAME
1	Display of Grayscale Images.
2	Histogram Equalization.
3	Non-linear Filtering.
4	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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	CS348	Subject Title	Advanced Computer Network					
LTP	3 0 2	**Credit**	4	**Subject Category**	DE	**Year**	3rd	**Semester**	6th

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
Network Layer design Issues, IPv4, IPv6, Shortest Path Routing, Distance Vector Routing, Flooding, Hierarchical Routing, Broadcast Routing, Multicast Routing.   **(7 L)**

Unit II
Wireless Networks, GSM Architecture, CDMA, Mobility in networks, Handoffs.Mobile IP- IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation.   **(7 L)**

Unit III
 Mobile TCP- Traditional TCP (Congestion Control, Slow Start, Fast Retransmit/Fast Recovery), Indirect TCP, Snooping TCP, Mobile TCP, Selective Retransmission, Transaction Oriented TCP.   **(8 L)**

Unit IV
Wireless LAN- Infrared Vs Radio Transmission, Infrastructure and Ad-hoc Network, IEEE 802.11-System Architecture, Protocol Architecture, Physical Layer, Bluetooth.   **(7 L)**

Unit V
IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management, SSL.   **(7 L)**

LEARNING OUTCOMES
At the end of the course the students will able to learn:
1. Ability to identify the essential components of networking
2. Ability to analyze the algorithms for routing, forwarding, lookup with respect to stability, robustness, scalability, security
3. Ability to analyze the performance of congestion control and resource management techniques
4. Ability to carry out further research in recent networking architectures

Text Book:
1. Jochen Schiller, "Mobile Communications".
2. Andrew S. Tanenbaum, "Computer Networks," Pearson Education
Reference Book:
1. Forouzan, B.A., Data communication and Networking, McGraw Hill (2006) 4thed.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT357	Subject Title	Internet of Things						
LTP	3 0 0	**Credit**	3	**Subject Category**	DE /OE	**Year**	3th	**Semester**	6th

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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

Reference books [RB]:

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT358	Subject Title	Neural Network						
LTP	3 0 0	Credit	4	Subject Category	DE	Year	3th	Semester	6th

Course Objective:

This course focuses on theoretical aspects of neural networks. neural networks paradigms and concepts such as Perceptrons, Hebbian learning, multi-layer networks, back propagation, self-organizing maps, stochastic networks, Adaptive Resonance Theory, and Hopfield networks will be integrated into this course.

Detailed Syllabus

UNIT 1

Introduction: Definitions, Historical background, Relationship to biological networks, Anatomy of a single neuron, **Neuron Model and Network Architectures:** Artificial Neural Networks, Single neuron and single layer of neurons, Inside an artificial neuron, Transfer functions, Multiple neurons, Topology of neural network architectures.

(4 L)

UNIT 2

Vector Spaces and Linear Transformations: Vectors, Linear transformations, Matrix operations Eigenvalues and Eigenvectors, Orthogonalization and diagnolization
Hebbian Learning: Linear associator, The Hebb rule, Variations of Hebbian learning

(10 L)

UNIT 3

Associative Learning: Associative network, Kohonen's learning law, Grossberg's learning law, Hopfield network, Brain State in a Box, Bi-directional Associative Memories (BAM)

(10 L)

UNIT 4

Multi-Layer Networks, Backpropagation, Convolutional Neural Networks, Recurrent Neural, Networks, Self-Organizing map, Raidal Basis Functions (RBF), Group Method of Data Handling (GMDH), **Stochastic networks:** Simulated annealing, Boltzman machine.   **(10 L)**

UNIT 5

Applications of neural networks: Pattern recognition & computer vision, Network design, Visualization, Time series forecasting, Generative Adversarial Networks (GAN)   **(6 L)**

Learning Outcome

Learning Outcomes Having successfully completed this course, the student will demonstrate:

1. Understand the mathematical concepts of the performance surfaces and different methods for optimizations.
2. Understand the concepts, and representation of most common neural network models.
3. Reason about the performance of neural networks and implement neural network models for particular applications

Text book [TB]:

- Jacek M. Zurada, **Introduction to Artificial Neural Systems**, PWS Publishing Company, 1995.
- Simon Haykin, Neural Networks: A Comprehensive Foundation, Macmillan College Publishing Company, 1994.
- Neural Network Design (2nd Edition), Martin T. Hagan, Howard B. Demuth, Mark H. Beale, Orlando De Jesus, LaureneFausett, Fundamentals of Neural Networks: Architectures, Algorithms, and Applications, Prentice Hall International, Inc., 1994.

Reference books [RB]:

- B. D. Ripley, Pattern Recognition and Neural Networks, Cambridge University Press., 1996

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT359	Subject Title	Mobile Computing and Services						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	3th	Semester	6th

Course Objective:
1. Understand the fundamentals of wireless networks.
2. Understand and evaluate emerging wireless technologies and standards
3. To explore mobile security issues
4. To explore the mobility concept.

Detailed Syllabus

UNIT 1
Introduction: Mobile computing with functions & devices, Networks, Middleware & gateways, Application & services, Developing mobile computing applications, Security & standards why it necessary, Architecture for mobile computing. **(3 L)**

UNIT 2
Emerging Technologies: Bluetooth, Rfid, WiMAX, Mobile IP, IPv6, GSM architecture, Call routing in GSM, Mobile computing over SMS, Value added service through SMS, GPRS architecture & operations, 3G & applications **(10 L)**

UNIT 3
Wireless Transmission:
Signal propagation- path loss of radio signals, additional signal propagation effects, Multipath propagation,
Multiplexing- Space division, frequency division, time division, code division,
Modulation- ASK, FSK, PSK, AFSK, APSK, Multi-carrier modulation
Spread spectrum- Direct sequence & frequency hopping
Mac- Hidden & exposed terminals, near- far terminal, SDMA, TDMA, FDMA, Fixed TDM, CSMA, PRMA, Multiple access with collision avoidance **(12 L)**

UNIT 4
Wireless LAN: IEEE 802.11 in details, HIPERLAN, Link manager protocol, L2CAP, security, SDP. **(5 L)**

UNIT 5
Mobility & Security in mobile computing: HTTP,
Wireless application protocol- architecture, wireless datagram protocol, wireless transport layer security, wireless transaction & session protocol, WML, Push architecture, push/ pull services, i-mode &SyncML
Information security, Security techniques & algorithms, public key infrastructure, **(10 L)**

Learning Outcome
At the end of the course, Learning Outcomes Having successfully completed this course, the student will demonstrate:
1: Apply the fundamental design paradigms and technologies to mobile computing applications.
2: Develop consumer and enterprise mobile applications using representative mobile devices and platforms using modern development methodologies.
3: Appraise the quality and performance of mobile applications.
4: Assess and implement security principles in mobile applications.
5: Evaluate wireless network topologies, wireless connectivity and characteristics, and the impact of wireless networks on security and Internet communications.
6: Select appropriate wireless technologies in commercial and enterprise applications.

Text book [TB]:
- Jochen H. Schiller: Mobile Communications - Second Edition, Pearson
- Asoke K Talukder&Roopa R Yavagal: Mobile Computing Technology, Applications and Service Creation – Tata McGraw-Hill Publishing Company Limited

Reference books [RB]:
- William Stallings: Wireless Communications & Networks - Second Edition, Pearson
- Theodore S. Rappaport : Wireless Communications Principles & Practice - Second Edition, Pearson

Subject Code	AR384	Subject Title	GREEN BUILDING						
LTP	3,0,0	Credit	3	Subject Category	OE	Year	3rd	Semester	VI

Course Objective: A growing worldwide concern for the conservation of energy & environment has led to the emphasis on sustainable habitats as a key solution to growing urban concerns. Sustainable architecture aims to create environment – friendly and energy efficient building by actively harnessing renewable nature sources of energy (solar energy etc) and utilizing materials that least pollute the environment.

UNIT-1 BIO CLIMATIC DESIGN CONCEPTS
Green buildings- salients features- LEED rating systems by IGBC - origin from USGBC –Concept of Sustainable sites –Orientation to sun and Wind -Land form & orientation – Vegetation & Pattern – Water Bodies – Open Space & Built form - Plan form & Elements – Roof form – Fenestration pattern & Configuration

Unit 2: PASSIVE AND ACTIVE HEATING TECHNIQUES
Passive Heating techniques: General principles – Direct gain systems - Glazed walls, Bay windows, attached sun spaces etc. Indirect gain systems – Trombe wall, Water wall, Solar Chimney, Transwall, Roof pond, etc - Isolated gain systems – Natural convective loop etc. Active Heating Systems: Solar water heating systems Case studies on buildings designed with passive and heating techniques.

Unit 3:PASSIVE AND ACTIVE COOLING CONCEPTS
Passive Cooling techniques : General principles – Evaporative cooling, Nocturnal radiation cooling, Passive Dessicant cooling, induced ventilation, earth sheltering, Berming, Wind Towers, earth – Air tunnels, Curved Roofs & Air Vents, Insulation , etc. Active Cooling techniques: Air coolers. Case studies on buildings designed with passive cooling techniques.

Unit 4: REDUCE, RECYCLE AND REUSE
Water conservation by Rainwater Harvesting systems – Treatment of waste water: Physical, Chemical and Biological methods – RootZone treatment -Use of recycled water. Use of Environment friendly materials, Embodied Energy of materials, Bio degradable materials. Recycling and Reuse of steel, Aluminium and Glass

Unit 5: INNOVATIVE GREEN TECHNOLOGIES AND CASE STUDIES
Innovative uses of solar energy : BIPV, Solar Forest, Solar powered street elements,- Innovative materials: Phase changing materials, Light sensitive glass, Self cleansing glass- Integrated Use of Landscape : Vertical Landscape, Green Wall, Green Roof. Case studies on Green buildings

LEARNING OUTCOME:
To create awareness of the green building requirement and technology used
To understand the role of environmental friendly buildings for sustainability
To understand the active and passive concepts used in energy efficient buildings

TEXTBOOK
1. Sustainable design manual, Vols 1& 2, The energy and resource institute, New Delhi
2. Arvind Krishnan & Others – Climate Responsive Architecture, Tata Mcgraw –Hill New Delhi

REFERENCES:
1. Ralph M .Lebens – Passive Solar Architecture in Europe – 2, Architecture Press, London 1983.
Sandra Mendler, William Odell, The Guide Book Of Sustainable Design, John Wiley & Sons,

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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   **03 hours** 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&AnushreeSahRawatSavera Publishing House, 1st edition-2016.

2. Logical Reasoning: Logical Reasoning and Data Interpretation for the CAT - Nishit K Sinha, Pearson India; 5th edition-2016.
   Logical Reasoning: Wiley's Verbal Ability and Reasoning - P A ANAND, Wiley-2016.
3. Verbal Aptitude: Oxford Guide to English Grammar- John Eastwood, Oxford University Press-2003.
   Verbal Aptitude: Fun with grammar- Suzanne W. Woodward Pearson Education ESL-1996.
4. Soft Skills: AComplete Kit for Group Discussion by S. Hundiwala; Arihant publications; edition-2018.
   Soft Skills: Basic Interviewing Skills by Raymond L. Gorden, Waveland Press, Inc.; 1 edition-1998.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT441	Subject Title	Deep Learning						
LTP	3 0 2	Credit	4	Subject Category	DE	Year	4th	Semester	7th

Course Objective:

1. Understand basic concepts in pattern recognition
2. Gain knowledge about state-of-the-art algorithms used in pattern recognition research
3. Understand pattern recognition theories, such as Bayes classifier, linear discriminant analysis.
4. Apply pattern recognition techniques in practical problems.

Course Pre/Co- requisite (if any) : Basics of Machine Learning, concept of statistics

Detailed Syllabus

UNIT 1

Linear Algebra: Scalars, Vectors, Matrices and Tensors, Multiplying Matrices and Vectors, Identity and Inverse Matrices, Linear Dependence and Span, Norms, Special Kinds of Matrices, Vectors, Eigen decomposition, Singular Value Decomposition, Example: Principal Components Analysis

Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Bayes' Rule, The Chain Rule of Conditional Probabilities, Independence and Conditional Independence, Expectation, Variance and Covariance, Structured Probabilistic Models.

(8 L)

UNIT 2

Machine Learning Basics: Learning Algorithms, Capacity, Over-fitting and Under-fitting Hyperparameters and Validation Sets, Estimators, Bias and Variance Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent.

(5 L)

UNIT 3

Regularization for Deep Learning: Parameter Norm Penalties,Norm Penalties as Constrained Optimization ,Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning. **(9 L)**

UNIT 4

The Convolution Operation, Motivation, Pooling ,Convolution and Pooling as an Infinitely Strong Prior ,Variants of the Basic Convolution Function, Structured Outputs ,Data Types, Efficient Convolution Algorithms, Optimization for Training Deep Models, Applications.

(6 L)

UNIT 5

Linear Factor Models**,** Probabilistic PCA and Factor Analysis, Independent Component Analysis (ICA),Monte Carlo Methods**,**The Log-Likelihood Gradient. **(7 L)**

Learning Outcome

At the end of the course Learning Outcomes Having successfully completed this course, the student will demonstrate:

1. Ability to apply knowledge of advanced principals to the analysis of electrical and computer engineering problems.
2. Ability to apply knowledge of advanced techniques to the design of electrical and computer engineering systems.

3. ability to use the appropriate state-of-the art engineering references and resources, including IEEE research journals and industry publications, needed to find the best solutions to electrical and computer engineering problems

Text book [TB]:

   1. Deep Learning, Ian Goodfellow, YoshuaBengio and Aaron Courville

Reference books [RB]:

   1. Building Machine Learning Systems with Python, Willi Richert, Luis Pedro Coelho, Packt open source.

List of Practicals

SR.NO.	EXPERIMENT NAME
1	Study of various Deep Learning Tools
2	Write a program to implement OR, AND gate using Perceptron with learning rule.
3	Write a program for classification in a data set.
4	Implement Linear Regression problem
5	Implement a classification/ logistic regression problem
6	Create, initialize and display simple variables and simple strings and use simple formatting for variable
7	Create/Define single dimension / multi-dimension arrays, and arrays with specific values like array of all ones, all zeros, array with random values within a range, or a diagonal matrix
8	Use conditional statements and different type of loops based on simple examples.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT442	Subject Title	Pattern Recognition						
LTP	3 0 2	Credit	4	Subject Category	DE	Year	4th	Semester	7th

Course Objective:
1. Understand basic concepts in pattern recognition
2. Gain knowledge about state-of-the-art algorithms used in pattern recognition research
3. Understand pattern recognition theories, such as Bayes classifier, linear discriminant analysis.
4. Apply pattern recognition techniques in practical problems.

Detailed Syllabus

UNIT 1
Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.
(9 L)

UNIT 2
Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions.
(5 L)

UNIT 3
Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

(9 L)

UNIT 4
Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor   Rule,   Fuzzy   classification.
(6 L)

UNIT 5
Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.
(7 L)

Learning Outcome
At the end of the course Learning Outcomes Having successfully completed this course, the student will demonstrate:

CO1:Ability to apply the knowledge of advanced principals to the analysis of electrical and computer engineering problems.
CO2:Ability to apply knowledge of advanced techniques to the design of electrical and computer engineering systems.
CO3: ability to use the appropriate state-of-the art engineering references and resources, including IEEE research journals and industry publications, needed to find the best solutions to electrical and computer engineering problems.

Text book [TB]:
5. .C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2013.
6. 2. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2014.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Reference books [RB]:

3. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2012.

List of Practicals

Sno.	Description
1.	Understanding basic functions of images in Matlab
2.	Understanding patterns using Matlab
3.	Write a code in matlab to read images and display.
4.	Write a code in matlab for edge detection.
5.	Write a code in matlab for applying PCA on set of images.
6.	Write a code in matlab for image classification using K-nearest algorithm.
7.	Write a code in matlab for fuzzy classification using images.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	CS442	Subject Title	CRYPTOGRAPHY AND NETWORK SECURITY					
LTP	3 0 2	**Credit**	4	**Subject Category**	DE	**Year**	4th	**Semester**	7th

COURSE 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.

Detailed Syllabus

Unit I :

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

(6 L)

Unit II :

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.

(8 L)

Unit III :

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. **(8 L)**

Unit IV:

Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME. **(6 L)**

Unit V :

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.

(8 L)

LEARNING OUTCOMES

After completing the course the students have knowledge

1. To Compare various Cryptographic Techniques
2. Demonstrate various data encryption techniques
3. Explain the various Security Application

Text Book:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersy.

Reference Book:

1. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag.
2. Bruce Schiener, "Applied Cryptography".

Course Structure of B.Tech – Information Technology
Applicable from 2018-2022 Batch

Subject Code	CS453	Subject Title	PARALLEL COMPUTING						
LTP	3 0 0	Credit	3	Subject Category	DE	Year	4th	Semester	VII

Course Objective:

Students undergoing this course are expected to learn different parallel programming models along with the technologies that enabling parallel computing

Detailed Syllabus

Unit-1 : Introduction   (5 L)
Why parallel computing? Shared memory and distributed memory parallelism, Amdahl's law, speedup and efficiency, supercomputers.

Unit-2: Message passing   (8 L)
MPI basics, point-to-point communication, collective communication, synchronous/asynchronous send/receive, algorithms for gather, scatter, broadcast, reduce.

Unit -3: Parallel communication   (9 L)
Network topologies, network evaluation metrics, communication cost, routing in interconnection networks, static and adaptive routing, process-to-processor mapping.

Unit- 4 : Performance, Designing Parallel codes   (7 L)
Scalability, benchmarking, performance modeling, impact of network topologies, parallel code analysis and profiling.
Domain decomposition, communication-to-computation ratio, load balancing, adaptivity.

Unit -5: Parallel I/O   (7 L)
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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT452	Subject Title	BUILDING ENTERPRISE APPLICATION					
LTP	3 0 0	Credit	3	Subject Category	DE-7	Year	4th	Semester	VII

Course Outline:

Course Objective:

1. The overall goal of the business enterprise application is to make familiar students with business/industry oriented applications.

2. The student will learn how to form attractive business models which will be suitable for industries.

Detailed Syllabus

UNIT 1
Introduction to enterprise applications and their types, software engineering methodologies, life cycle of raising an enterprise application, introduction to skills required to build an enterprise application, key determinants of successful enterprise applications, and measuring the success of enterprise application

(**4 L**)

UNIT 2
Inception of enterprise applications, enterprise analysis, business modeling, requirements elicitation, use case modeling, prototyping, nonfunctional requirements, requirements validation, planning and estimation

(**6 L**)

UNIT 3
Concept of architecture, views and viewpoints, enterprise architecture, logical architecture, technical architecture - design, different technical layers, best practices, data architecture and design – relational, XML, and other structured data representations, Infrastructure architecture and design elements - Networking, Internetworking, and Communication Protocols, IT Hardware and Software, Middleware, Policies for Infrastructure Management, Deployment Strategy, Documentation of application architecture and design

(**10 L**)

UNIT 4
Construction readiness of enterprise applications - defining a construction plan, defining a package structure, setting up a configuration management plan, setting up a development environment, introduction to the concept of Software Construction Maps, construction of technical solutions layers, methodologies of code review, static code analysis, build and testing, dynamic code analysis – code profiling and code coverage

(**12 L**)

UNIT 5
Types and methods of testing an enterprise application, testing levels and approaches, testing environments, integration testing, performance testing, penetration testing, usability testing, globalization testing and interface testing, user acceptance testing, rolling out an enterprise application.

(**6 L**)

Learning Outcome
At the end of the course

Learning Outcomes Having successfully completed this course, the student will demonstrate:

1. An ability to cope up with industry projects.

2. Ability to work on live web as well as android project in MNCs.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Text book [TB]:

1. Raising Enterprise Applications – Published by John Wiley, authored by AnubhavPradhan, Satheesha B. Nanjappa, Senthil K. Nallasamy, VeerakumarEsakimuthu.
2. Building Java Enterprise Applications – Published by O'Reilly Media, authored by Brett McLaughlin.

Reference books [RB]:

3. Software Requirements: Styles & Techniques – published by Addison-Wesley Professional
4. Software Systems Requirements Engineering: In Practice – published by McGraw-Hill/Osborne Media.
5. Managing Software Requirements: A Use Case Approach, 2/e – published by Pearson
6. Software Architecture: A Case Based Approach – published by Pearson

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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:
 Apply principles of remote sensing and GIS to collect, map and retrieve spatial information.
1. Plan, assess and evaluate natural and manmade systems using geospatial models and methods.
2. Use geospatial tools and techniques for hazard mitigation and resource planning.
3. Pursue research and develop capabilities to handle multi-disciplinary field projects.
4. 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]:
3. Fundamentals of Spatial Information Systems by Robert laurini and Derek Thompson, Academic Press.
4. Geographical Information Systems, Vo. I and II edited by Paul Longely, M.F. Goodchild, et.al, John Wiley and Sons, Inc. 2015.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT411	Subject Title	Big Data Analytics						
LTP	**2 0 2**	**Credit**	3	**Subject Category**	DC	**Year**	**4th**	**Semester**	7th

Course Objective:

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.

Detailed Syllabus

UNIT 1
Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modelling and validation – introduction to NoSQL. **(4 L)**

UNIT 2
Choosing and evaluating models – mapping problems to machine learning, evaluating clustering models, validating models – cluster analysis – K-means algorithm, Naïve Bayes – Memorization Methods – Linear and logistic regression – unsupervised methods. Introduction of big data analytics tools with few lectures/tutorial in practical mode. **(10L)**

UNIT 3
Reading and getting data into R – ordered and unordered factors – arrays and matrices – lists and data frames – reading data from files – probability distributions – statistical models in R - manipulating objects – data distribution with few lectures/tutorials in practical mode. **(8 L)**

UNIT 4
Introduction – distributed file system – algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce – Hadoop - Understanding the Map Reduce architecture - Writing Hadoop Map Reduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting - Reducing phase execution with few lectures/tutorials in practical mode. **(12L)**

UNIT 5
Documentation and deployment – producing effective presentations – Introduction to graphical analysis – plot() function – displaying multivariate data – matrix plots – multiple plots in one window - exporting graph - using graphics parameters with few lectures/tutorials in practical mode.
(6 L)

Learning Outcome
At the end of the course, the student can :
1. To understand the significance of big data.
2. 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.
3. To understand the challenges of big data and how to deal with the same.
4. Students can visualize the data using machine algorithms with R and Hadoop

Text book [TB]:
1. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.
2. Jure Leskovec, AnandRajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Reference books [RB]:

1. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley & Sons, Inc., 2012.
2. 4. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.

List of Practicals

SR.NO.	EXPERIMENT NAME
1	Loading the data and manipulating the data in R
2	Applying the statistical models in R
3	ML Models in R
4	HDFS introduction.
5	Store the basic information about students such as roll no, name, date of birth , and address of student using various collection types such as List, Set and Map
6	Develop Map Reduce Work Application
7	Creating the HDFS tables and loading them in Hive and learn joining of tables in Hive
8	Data visualization using different plots

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	HS481	Subject Title	Application of Psychology						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	IV	Semester	VII

Course Objective

- To develop a broad base of knowledge in the various domains of psychology and its applications.
- To Synthesis and demonstrate of useful skills in the field of psychology namely areas of organization, society, stress management etc.

Unit 1   Role of Psychology in Understanding the Self   7Hrs.

Three Stages – Self awareness, Self acceptance and Self realization; Exploration through JOHARI Window; Development of Self-Mead & Cooley

Unit 2   Application of Psychologyat Work Place   7Hrs.

Work Motivation: Theories and applications: Maslow, Herzberg, Goal Setting ,Emotion: Emotional Quotient & Job Satisfaction, Early approaches to leadership, contemporary approaches to leadership-Transformational & Transactional Leadership, styles of leadership

Unit 3   Application of Psychology in Personal & Professional Excellence   6Hrs.

Achieving Success: Creativity &Innovation ; Role of attitude; Role of competence; Role of Self-confidence; Time management; Role of Human Values

Unit 4   Role of Psychology in Health & Fitness   6Hrs.

Stress & Coping Strategies: Meaning, Types, Sources, Effects of stress on health, and coping strategies; Characteristics of a healthy personality

COURSE OUTCOME:

- The students will be able to understand basic concepts of psychology in major domains.
- The students will be able to apply the fundamentals of psychology in order to solve real life problems.
- The students will Use scientific reasoning to interpret psychological phenomena.
- To apply ethical standards to evaluate psychological science and practice

TEXT BOOKS

1. R. Bayne, and I. Horton, *Applied Psychology*, Sage publications, 2003.
2. A. Furnham, *The Psychology of Behaviour at Work*, Psychology Press, 1997.
3. D. Harris, *Engineering Psychology and Cognitive Ergonomics*, Aldershot: Ashgate, 1997

REFERENCE BOOKS

- Baron, R.A. and Misra, G., Psychology (Indian Subcontinent Edition). Person Education Ltd. (2014).
- Ciccarelli, S.K. & Meyer, G.E., Psychology (South Asian Edition). New Delhi: Tata Mc Graw Hill. (2008).
- Passer, M.W., Smith, R.E., Holt, N. and Bremmer, A., Psychology: The Science of Mind and Behavior, McGraw-Hill Education, UK. (2008).
- R. Gifford, (Ed.), Applied psychology: Variety and opportunity, Allyn and Bacon, 1991.
- M.L. Blum, and J.C. Naylor, Industrial Psychology, CBS Publishers & Distributors, 1984.
- D.M. Pestonjee, Stress and Coping: The Indian Experience, 2nd ed., Sage Publications, 1999.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Humanities Electives III

Subject Code	HS484	Subject Title	Intellectual Property Rights						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	IV	Semester	VII

Course Objective

Unit 1 Introduction of IP   **5Hrs.**

- To provide the basic understanding of intellectual property rights, the rationale behind making provision for these rights and the recent concerns in the field.
- To increase the attention of students to protect their IP though legal provision and also they can reduce the imitation rate.
- To increase the understanding of students to get their involvement in technology transfer and commercialization

Public Funded Research and Its Implications in an Economy; Public Funded Research and Economic Development; Research & Development and Industrial Development

Unit 2 Historical Perspectives of IPRs   **4Hrs.**

History and concept of Property; Introduction to intellectual property rights (IPRs); Patent, Industrial design; Copyrights, Trademarks, Geographical Indications; Trade Secrets; International aspect of IPRs; Development at International level regarding IPRs

Unit 3 Polices on IPRs in India   **10 Hrs.**

The debate: Copyright vs Copy left; Research ethics; role of IPRs in economic development in developed and developing economies; Overview of Various Policies on IPRs in India; Success Story of Bayh Dole Act of IPRs in USA

Unit 4 IPRs and Technology Commercialization   **7Hrs.**

Technology Transfer and Commercialization; Key Determinants and Participants of Technology Transfer and Commercialization; Types of Technology Transfer and Commercialization; Technology Transfer and Commercialization in India and Other Developing Economies

COURSE OUTCOME

- The students will be able to understand the importance of IPRs in academic field.
- The student gets idea how they can protect their IP through IPRs regime.
- The student gets more incentive towards technology transfer and commercialization
- Apply intellectual property law principles (including copyright, patents, designs and trademarks) to real problems and analyse the social impact of intellectual property law and policy

TEXT BOOKS

a. Cornish, W.R. and L. David. 2010. 7th Edition. Intellectual Property: Patents, Copyrights, Trademarks and Allied Rights. Sweet and Maxwell.
b. Narayan, P. 2002. Intellectual Property, Law in India, 3rd Ed. New Delhi, Delhi Law House.
c. Ganguli, P. 2001. Intellectual Property Rights: Unleashing the Knowledge Economy. Tata McGraw Hills.
d. Watal, J. 2001. Intellectual Property Rights in the WTO and Developing Countries. New Delhi: Oxford University Press.

REFERENCE WORK

- Singh A.K., Ashraf S.N. and Acharya S.R. 2017. Viability of Bayh Dole Act of USA in the context of India: Critical evidence from review of literature, in SasiMisra, Sunil Shukla and GanapathiBatthini (Eds). Proceedings of the 12th Biennial Conference on Entrepreneurship Organized by EDII Ahmedabad (pp. 235-252). Bookwell Publishing House: New Delhi.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Humanities Electives III

Subject Code	HS482	Subject Title	Human Values						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	IV	Semester	VII

Course Objective
- To inculcate the skills of ethical decision making and then to apply these skills to the real and current challenges of the engineering profession.
- To enable student to understand the need and importance of value-education and education for Human Rights.

Unit 1 INTRODUCTION   5Hrs.

Nature of Value-Crisis in the contemporary Indian society, Meaning, Nature & Types of Values; Sources of Value Formation, Foundational Human Values – Integrity, Freedom, Creativity, Morals, Love and Wisdom, Case Studies Case Studies on the above aspects

Unit 2 SOCIETAL VALUES & MATERIAL VALUES   6Hrs.

Definition of Society, Units of Society, and Social Consciousness. Concepts & Principles of Interdependence, Conceptualizing 'Good Society' and 'Social Goods' and Corporate Social Responsibility, Role of Material Values in promoting Human Well-being. Role of Science and Technology; Problems of Material Development, Case Studies Case Studies on the above aspects

Unit 3 PSYCHOLOGICAL & SPIRITUAL VALUES   7Hrs.

Humanistic Psychology; Concept of Intelligence, Emotional Intelligence& Mental health; Cognitive Dissonance & Ego Defense, Maslow's Hierarchy of Human Need; Characteristics of 'Self-Actualizing' persons; Understanding Common Religion & Concept of Dharma and Spirituality; Case Studies Case Studies on the above aspects

Unit 4 PSYCHOLOGICAL & SPIRITUAL VALUES   8Hrs.

Bases for moral Judgments: Customary Morality, Religious Morality, Reflective Morality. Concept of Professional values: Competence , Confidence , Devotion to Duty, Efficiency , Accountability , Respect for learning / Learned , Willingness to Learn, Open and Balanced mind; Team spirit ; Willingness for Discussion, Aims, Effort , Avoidance of Procrastination and Slothfulness, Alertness, IEEE; Case Studies Case Studies on the above aspects

COURSE OUTCOME
- Students are expected to become more aware of their self and their relationships and would have better reflective and discerning ability.
- They would also become more sensitive to their surroundings including both people and nature, with commitment towards what they believe in (human values).
- To understand how universal values can be uncovered by different means, including scientific investigation, historical research, or public debate and deliberation (what some philosophers call a dialectic method)
- To understand and discuss the idea of moral relativism and the challenges it poses to universal values

TEXT BOOK
Human Values - Prof. A.N.Tripathi New Age International, 2009

REFERENCE BOOK
Human Values and Professional Ethics - Jayshree, Suresh and B.S. Raghwan , S. Chand Publication, 2011-12

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Humanities Electives III

Subject Code	HS492	Subject Title	Indian English Literature						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	IV	Semester	VII

Course Objective

- The course will enable the students to understand the level of Indian English Literature.
- It will also enable the students to understand different genres such as prose, poetry, and fiction in Indian Writers in English.

Unit 1   Hrs-7
Prose
APJ Abdul Kalam: Unity of Minds
Mahatma Gandhi: Hind Swaraj What is Civilization? (Chapter XIII) Education (Chapter XVIII)
Swami Vivekananda: The Cosmos-Macrocosm

Unit II   Hrs-6
Poetry
Rabindranath Tagore: Geetanjali – Where the mind is without fear
Kamla Das: An Introduction
Nissim Ezekiel: The Night of Scorpion
Sarojani Naidu: Life
Toru Dutt: Our Casuarina Tree
Sri Arbindo: Stone Goddess

Unit III   Hrs-8
Short Stories
R.N.Tagore: Kabuliwala
R.K. Narayan: An Astrologer's Day
Mulk Raj Anand: Duty
Nayantara Sehgal: Martand
Unit IV   Hrs-5
Novel
Ruskin Bond: Flights of Pigeons
Course Outcome:

- The students will develop an insight into Indian literature.
- The students will learn to appreciate different genres of literature of Indian Literature in English.
- The students will understand the role of literature in reflecting the social context and the shaping of a young nation.
- The students will demonstrate knowledge and comprehension of major texts and traditions of language and literature written in English as well as their social, cultural, theoretical, and historical contexts.

Text Books

- Kumar, Shiv K. (ed),Contemporary Indian Short Stories in English, 2007 SahityaAkademi
- Anand, Mulk Raj; SarosCowasjee (ed.);Selected Short StoriesPenguin Books, 2006
- Bond, Ruskin. Flights of Pigeons, Penguin Books, 2003
  Reference Books
- Tagore, Rabindra. *Nationalism*. Delhi: Rupa Publications, 1992.Print.
- Chinhade, Sirish. *Five Indian English Poets*. New Delhi: Atlantic Publishers and Distributors, 1996.Print.
- Naik, M.K. *A History of Indian English Literature*. New Delhi: SahityaAkademi, 2004.Print.
- Agrawal, K.A. Ed. *Indian Writing In English: A Critical Study*. Atlantic Publishers &Dist, 2003.Print.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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.

Subject Code	EC383	Subject Title	Consumer Electronics						
LTP	3 0 0	**Credit**	3	**Subject Category**	DE/OE	**Year**	4th	**Semester**	VII

Objectives of the Course: The students will learn

- Consumer Electronics and its application
- Concept of audio and video related system.
- Concepts of recording and power supplies.

UNIT-I
Audio Systems: Microphones, Loudspeakers, Speaker baffle and enclosure, Acoustics, Mono, Stereo, Quad, Amplifying Systems, Equalisers and Mixers, Electronic Music Synthesisers, Commercial Sound, Theater Sound System

8LU

UNIT – II
Video Systems and Displays: Monochrome TV, Colour TV standards and systems, TFT, Plasma, HDTV, Digital TV, Video Telephone and Video Conferencing **8L**

UNIT III:
Domestic Appliances: Washing machines, Microwave ovens, Air- conditioners and Refrigerators, In car computers Office Systems: FAX, Xerox, Telephone Switching System, Mobile Radio System

8L

UNIT IV:
Recording and Reproduction Systems: Disc recording and reproduction, Magnetic recording and reproduction, Video tape recording and reproduction, Video disc recording and play back, Distortion and Noise reduction in Audio and Video System **8L**

UNIT-V
Power Supplies and other systems: SMPS, UPS and Preventive Maintenance, Set Top Boxes, Remote controls, Bar codes, ATM **8L**

Text Books:
1. Consumer Electronics S P Bali Pearson ed 2005

OUTCOMES OF THE COURSE:
The course provides an understanding of:

- Electronic systems related to consumer applications.
- Principle of working of various home appliances.
- Skills to use modern consumer electronics systems used in day to day life.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	EC385	Subject Title	Analog Electronics						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VII

Objectives of the Course: To teach the fundamental concepts of various electronic devices, circuits and their application. To develop ability among students for problem formulation, system design and solving skills.

UNIT-I

Semiconductor materials and properties Group-IV materials, Covalent bond, electron-hole concepts Basic concepts of energy bands in materials, concepts of forbidden gap Intrinsic and extrinsic semiconductors, donors and acceptors impurities   **4L**

UNIT-II

Junction diode and diode applications p-n junction, depletion layer, v- i characteristics, diode resistance, capacitance diode ratings (average current, repetitive peak current, non-repetitive current, peak-inverse voltage).   **4L**

Diode Applications Rectifiers (half wave and full wave), filter (C – filter), clipping circuits, clamping circuits, voltage multipliers   **4L**

UNIT-III

Breakdown diodes Breakdown mechanisms (zener and avalanche), breakdown characteristics, zener diode application as shunt regulator **4L**

UNIT-IV

Bipolar Junction Transistor Basic construction, transistor action, CB, CE and CC configurations, input/output

Characteristics, Transistor Amplifier Graphical analysis of CE amplifier, concept of voltage gain, current gain.

          6L

UNIT-V

Field Effect Transistor

JFET: Basic construction, transistor action, concept of pinch off, maximum drain saturation current, input and transfer characteristics, characteristics equation CG, CS and CD configurations,
MOSFFT: depletion and enhancement type MOSFET-construction, operation and characteristics.

          6L

Reference Books:

1. Boylestad and Nashelsky, 'erlectronic Decvices and circuits' PHI, 6e, 2001.
2. A Mottershead, 'Electronic devices and circuits'. PHI, 2000.
3. Morris Mano, 'Digital Computer Design', PHI, 2003.
4. R.K. Singh & Ashish, Basic Electronics Engg. Laxmi Publication, 2007.

5. Milman & Halkias, Integrated electronics Electronics, PHI, 2005.

OUTCOME OF THE COURSE:
- Students will be able to build, develop, model, and analyze the electronic circuits along with learning the device ratings and characteristics
- Students will be able to design and analyse electronic circuits

List of Experiments:
1. To study V-I characteristics of p-n junction diode.
2. To study V-I characteristics of zener diode.
3. To study half-wave rectifier and calculate ripple factor and efficiency.
4. To study full-wave rectifier and calculate ripple factor and efficiency.
5. To study clipper circuits.
6. To study clamper circuits.
7. To study the input and output characteristics of CB and CE transistor.
8. To study drain and transfer characteristics of JFET.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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.**

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	ME342	Subject Title	Composite Materials						
LTP	30 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VII

Course Objective: To enable the students, know and understand the mechanical behavior of composite materials
Course Pre/Co- requisite (if any): Strength of Materials, Materials Engineering

Detailed Syllabus

UNIT 1:
Definition and applications of composite materials, classifications, Fibers- glass, carbon, ceramic and aramid fibers. Matrices- polymer, graphite, ceramic and metal matrices; characteristics of fibers and matrices. Fillers and whiskers. Advantages and limitations of composites

UNIT 2:
Mechanical behaviour of composite materials, surface treatment of fibers, thermosets matrix materials, Thermoplastics and other matrix materials, Manufacturing of thermoset composites, bag moulding, compression moulding, pultrusion, filament welding, other manufacturing processes

UNIT 3:
Composite mechanics Terminology, Behaviour of unidirectional composites, Behaviour of short fiber composites Analysis of orthotropic ply. Hook's Law for orthotropic lamina, Relation between Engg. constants and Elements of matrices for orthotropic ply, Transformation of Engg. constants, Failure in isotropic materials

UNIT 4:
Analysis of laminated composites, symmetric laminates, angle ply laminates, cross ply laminates, laminate, evaluation of lamina properties, determination of stress and strain in laminate, maximum stress and strain criteria, von Mises Yield criterion for isotropic materials,   .

UNIT 5:
Residual stresses during curing, prediction of laminate failure, thermal analysis of composite laminates. Analysis of laminated plates - equilibrium equations of motion, static bending analysis, buckling analysis, free vibrations, natural frequencies.

Learning Outcome

At the end of the course the student can:
CO1:Have an overview of the mechanical behaviour and application of composite materials.
CO2:Get an overview of the methods of manufacturing composite materials
CO3: students will understand various mechanics of composite materials.

Text book [TB]:
1. Gibson R.F. Principles of Composite Material Mechanics, second edition, McGraw Hill, 1994.
2. Hyer M.W., Stress Analysis of Fiber- Reinforced Composite Materials, McGraw Hill, 1998.

Reference books [RB]:
1. F. L. Matthews, Rees D. Rawlings , Composite Materials: Engineering and Science Woodhead Publishing, 1999 - Composite materials.
2. Autar K. Kaw, Mechanics of Composite Materials,CRC Press, 30-May-1997

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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.

Subject Code	PE481	Subject Title	Fuel Technology						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VII

1. Course Summary

This course will introduce students to classification of fuel and their properties. In this course, students unable to understand coal preparation, coal storage process, coal gasification process. This course also covers various topics which includes Fischer Tropsch Synthesis, Gaseous and liquid fuels i.e. natural gas, producer gas, water gas, coal gas, biogas, LPG, kerosene, diesel. Students will also learn combustion mechanism for solid, liquid and gaseous fuel.

2. Course Objectives

The students should be able to:

1. Understand different types of fuel, basic terms in fuels and combustion
2. Understand the coal preparation and conversion of coal into suitable products using gasification and Fishers Tropsch Synthesis process.
3. Understand physical and chemicals properties of different types of fuel and their storage techniques, combustion mechanism
4.

3. Course Outcomes

A good knowledge of this course will enable students to:

1. Understand origin of different of types of fuel and their properties and classification
2. Understand the Coal preparation and storage techniques, Physical and chemical properties of coal, Briquetting and liquefaction of solid fuels
3. Understand the conversion of coal into useful products using gasification techniques and Fischer Tropsch Synthesis
4. Understand about gaseous and liquid fuels, their physical and chemical properties and Testing methods for these fuels
5. Understand about combustion mechanism for different types of fuels and Furnace elements.

4. Curriculum Content

UNIT 1

Classification of Fuel- Solid Fuels, Liquid Fuels, Gaseous Fuels, Various Terms Related to the Study ofFuels and Combustion. Coal-Origin, Composition, Petrography,Analysis and Properties of Coal,Classification of coal

UNIT 2

Coal Preparation, Coal Storage, Coal Carbonization and by-product Recovery. Physical and Chemical, Properties of Coke.Briquetting of Solid Fuels. Liquefaction of Solid Fuels

UNIT 3

Coal: A Source of Energy- Gasification of Coal. Fixed Bed Gasification, Fluidized Bed Gasification,Entrained Bed Gasification. Integrated Gasification Combined Cycle (IGCC).Underground Gasificationof Coal. Indian Scenario related to Coal Gasification. Coal to Liquid (CTL) via Fischer – Tropsch (F-T)Synthesis.

UNIT 4

Gaseous and Liquid Fuels- Natural gas, Producer gas, Water gas, Carbureted Water gas, Coal gas, Gasesfrom biomass, LPG. Gasoline, Kerosene, Diesel.Physico Chemical Properties and Testing of LiquidFuels. Coal Tar Fuels (CTF).

UNIT 5

Combustion: General Principle of Combustion, Combustion of Solid Fuels – Grate Firing and Pulverized Fuel Firing System. Combustion of Liquid Fuels, Burners for Liquid and Gaseous Fuels Combustion

Text book [TB]:

1. **Kuo, K.K., Principles of Combustion, John Wiley and Sons, Inc. (2005).**
2. **Sarkar, S., Fuels and Combustion, Orient Longman, (1990).**

Reference books [RB]:

1. **Sharma, S.P., and Chander, M., Fuels and Combustion, Tata Mcgraw Hill (1984)**

5. **Teaching and Learning Strategy**
   All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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.

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).

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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

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. DrUmakantPanwar – Entrepreneur
    3. MrVivekHarinarian- Entrepreneur.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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 courseThe 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

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Reference books [RB]:

4. Gerald Tel, "Distributed Algorithms", Cambridge University Press
5. 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

Subject Code	IT462	Subject Title	Computer Vision and Robotics					
LTP	2 0 2	Credit	3	Subject Category	DE	Year	4th	Semester	8th

Course Objective: The objective of this course to give the knowledge of image processing with the concept of AI. This course also give the detail knowledge of feature extraction, stereo vision.

Course Pre/Co- requisite (if any) : Basics of Image processing and Pattern recognition.

Detailed Syllabus

UNIT 1

Image formation and camera calibration: images, representing acquiring, and displaying image, types of images, noise, filtering, image processing, preprocessing, Introduction to computer vision, sensing, AI, geometric camera models, orthographic and perspective projections, weak perspective projection, intrinsic and extrinsic camera parameters.   **(8 L)**

UNIT 2

Feature detection and matching: Edge detection, interest points and corners, local image features, feature matching and Hough transform, model fitting and RANSAC, scale invariant feature matching.

Stereo Vision and motion: Stereo camera geometry, essential and fundamental matrix, image rectification, local methods for stereo matching: correlation and multi-scale approaches, global methods for stereo matching, Camera self-calibration, Euclidean structure and motion from two images.

(8 L)

UNIT 3

Shape from Shading: Modeling pixel brightness, reflection at surfaces, the Lambertian and specular model, area sources, photometric stereo: shape from multiple shaded images, modeling inter-reflection, shape from one shaded image.

Robotics: Overview of Robots -Past, Present, Future, Basics in Robotics, Robot Behaviors, Hardware, Design, Design Challenge.   **(10L)**

Learning Outcome

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

1. Understand differences between computer vision and image processing.
2. Know the basic components of a computer vision system.
3. Understand how images are represented; including optical images, analog images, and digital images
4. Understand the Robotics concepts.

Text book [TB]:

1. Forsyth, D. A. and Ponce, J., "Computer Vision: A Modern Approach", Prentice Hall, 2nd Ed.
2. Szeliki, R., "Computer Vision: Algorithms and Applications", Springer
3. Hartley, R. and Zisserman, A., "Multiple View Geometry in Computer Vision", Cambridge University Press

Reference books [RB]:

1. Gonzalez, R. C. and Woods, R. E., "Digital Image Processing", Prentice Hall, 3rd Ed.
2. Trucco, E. and Verri, A., "Introductory Techniques for 3-D Computer Vision", Prentice Hall

List of Practical's

Sno.	Description
1.	Write Matlab Program for Image negative , Gray level Slicing
2.	Write Matlab Program for Dynamic range compression &Bit plane slicing
3.	Write Matlab Program for Histogram Processing.
4.	Write Matlab Program for Image smoothing
5.	Write Matlab Program for Image sharpening.
6.	Write Matlab Program for Edge detection.
7.	Write Matlab Program for lossless Image Compression.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT463	Subject Title	Software Project Management					
LTP	2 0 2	Credit	3	Subject Category	DE	Year	4th	Semester	8th

Course Objective:

1. Project Management is generally seen as a key component of successful software projects. Together with software techniques it can produce software of high quality.

2. This course aims to cover the basics Deliver successful software projects that support organization's strategic goals Match organizational needs to the most effective software development model Plan and manage projects at each stage of the software development life cycle (SDLC)

3. Create project plans that address real-world management challenges Develop the skills for tracking and controlling software deliverables

Course Pre/Co- requisite (if any): Software Engineering.

Detailed Syllabus

UNIT 1

Introduction to software project management, software projects versus other projects, activities covered by software project management, plans, methods, category of software projects, success and failure of a project, management control. Project management and evaluation, project portfolio management, cost benefit evaluation techniques, risk evaluation, programme management, resource allocation within programmes, strategic programme management, benefits management. Overview of project planning, project selection, project scope identification, project infrastructure identification, project characteristics, identification of project product and activities, effort estimation, activity risks, resource allocation, review plan, lower level plan execution.   **8 L)**

UNIT 2

Selection of appropriate project approach, build or buy, selection of methodologies, choice of process models, structure versus speed of delivery, waterfall model, spiral model, software prototyping, incremental delivery, agile methods, extreme programming, iterative process management. Software effort estimation, problems with under and over estimation, basis for software estimation, estimation techniques, bottom-up estimating, top-down and parametric models, expert judgment, estimation by analogy, COCOMO13, function point analysis; activity planning, when to plan, project schedules, sequencing and scheduling activities, network planning models, adding time dimension, forward pass, backward pass, critical path identification, activity float, project shortening, critical activity identification, activity on arrow; risk management, categories of risk, framework for risk, risk identification, risk assessment, risk planning, risk evaluation, PERT, critical chain concepts.   **(8 L)**

UNIT 3

Resource allocation, nature of resources, identification of resource requirements, scheduling resources, creating critical path, counting the cost, cost schedule, scheduling sequence; monitoring and control, creating framework, collecting data, visualizing progress, cost monitoring, earned value analysis, priority monitoring, change control; managing contracts, types of contracts, stages in contracts, terms of contracts, contract management, acceptance of contract. Managing People, understanding behavior, organization behavior, selecting the right person for the job, best method for instruction, motivation, Oldham-Hackman job model, stress, health and safety; working in teams, becoming a team, decision making, coordinating dependencies, dispersed and virtual teams, communication of genres and plans, leadership; software quality, software quality in project planning, importance of software quality, ISO 9126, product versus process quality management, quality management system, process capability models, techniques to help enhance software quality, testing, quality plans.   **(8 L)**

Learning Outcome

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

1. develop plans with relevant people to achieve the project's goals.
2. break work down into tasks and determine handover procedures.
3. identify links and dependencies, and schedule to achieve deliverables.

4. estimate and cost the human and physical resources required, and make plans to obtain the necessary resources.

Text book [TB]:

7. Shtub, Bard, and Globerson,"Project Management: Engineering, Technology, & Implementation", Prentice Hall

8. Bob Hughes, Mike Cotterell, "Software Project Management", Tata McGraw Hill

9. Futrell RT, Shafer LI, Shafer DF. Quality software project management. Prentice Hall PTR; 2001 Nov 1.

Reference books [RB]:

6. Burke R. Project management: planning and control techniques. New Jersey, USA. 2013.
7. Raftery J. Risk analysis in project management. Routledge; 2003 Sep 2.

List of Practicals

1: Study the complete Software Development Life Cycle (SDLC) and analyze various activities conducted as a part of various phases. For each SDLC phase, identify the objectives and summaries outcomes.

2: Consider any project to be developed in any technology as a Software Architect or Project Manager. Construct Software Requirement Specification (SRS) document for the project.

3: Considering your immense expertise in software development, The Absolute Beginners Inc. has recently allotted you a mega project. The goal of the project is to create a database of all Hindi films released since 2000. The software would allow one to generate a list of top ten hit films, top ten flop films, best comedy films, and so on. Using your prior experience, you have decided the approximate sizes of each module of the software as follow:

4: Function Point: Analyze the case study and identify the error and solve it. At the end, need to assess calculation part of effort using FP oriented estimation model.

5: Consider the following Java code segment:
1. Guarantees that all independent execution path is exercised at least once;
2. Guarantees that both the true and false side of all logical decisions are exercised;
3. Executes the loop at the boundary values and within the boundaries.
Sketch out Design control flow diagram and Apply Cyclomatic complexity for given Code. Identify numbers of Independence path require for testing

6: Subject Project: For below mentioned Systems and other systems assign a mini-project two a group of students to prepare Software documents mentioned as A to E Library Information System, Villager Telephone System, Waste Management Inspection Tracking System (WMITS), Flight Control System, Ambulance Dispatching System
6.1: Development of Software Requirements Specification
6.2. Function oriented design using SA/SD,
6.3. Object-oriented design using UML
6.4. Test case design, E. Implement
7: Study of various Web Based software project management Tools
7.1 Software: -Rational Rose, Microsoft Visio, Enterprise resource planning
7.2 Project Management Tools
7.3 SCM Tools
7.4 SQA Tools
7.5 Analysis and Design Tools
7.6 User Interface Development Tools
7.7 Object-Oriented Software Engineering Tools
7.8. Testing Tools

Subject Code	IT471	Subject Title	Knowledge Management						
LTP	2 0 0	Credit	2	Subject Category	DE	Year	4th	Semester	8th

Course Objective:

To determine and apply knowledge of complex project management theory, principles and best practice to applied projects to contribute to the profession and discipline of project management. Critically analyze, synthesize and reflect on project management theory and developments, both local and international, to extend and challenge knowledge and practice. Professionally communicate and justify project scope, design, implementation, strategy and /or outcomes, engaging effectively with diverse stakeholders across a range of industry sectors. To apply the specialist knowledge and technical skills required to creatively address the diverse needs of project stakeholders, formulating innovative solutions and demonstrating independent and sound decision making related to your professional practice and the discipline. To provide strategic project management advice and utilize leadership skills and team work skills to plan and guide the implementation of projects across diverse project management contexts, contributing to the discipline and professional arena. To utilize specific research and technical skills to strategically develop and implement project management strategies and solutions that are responsive to complex sustainable and economic theories and enhance project value, delivery and governance.

Detailed Syllabus

UNIT 1

An Introduction to knowledge management: The foundations of knowledge management including cultural issues, technology applications, organizations concepts and processes, management aspects and decision support systems. The evolution of knowledge management from information management to knowledge management, key challenges, ethics for knowledge management.

Creating the culture of learning and knowledge sharing: Organization and knowledge management, building the learning organization, knowledge markets- cooperation among distributed technical specialists, tacit knowledge and quality assurance. **(10L)**

UNIT 2

Knowledge management tools: Telecommunication and networks in knowledge management, internet search engines and knowledge management, information technology in support of knowledge management, knowledge management and vocabulary control, information mapping in information retrieval.

Knowledge Management Applications: Components of a knowledge management.

(9 L)

UNIT 3Case Studies: From library to knowledge center, knowledge management in health sciences.

Future trends and case studies: Advanced topics and case studies in knowledge management, development of a knowledge management map/plan that is integrated with an organization's strategic and business plan.

(7 L)

Learning Outcome

At the end of the course, Learning Outcomes Having successfully completed this course, the student will demonstrate:

1. Examine and evaluate how leadership can be used to facilitate a human infrastructure to diffuse knowledge and enable best practice.
2. Apply Knowledge Management objectives in projects across diverse fields
3. Identify the drivers and inhibitors of effective KM practices to promote innovation and improving project management business practices

Text book [TB]:

1. Srikantaiah, T.K., M., Knowledge Management for the information Professional, Information Today, Inc, 2000.
2. D. Hislop, Knowledge Management in Organizations, Oxford University Press; Second edition (6 November 2009)
3. R.C.Agrawal, Knowledge Management Tools & Techniques , Neha Publishers and Distributors, 2009

Reference books [RB]:

2. Knowledge Management using Enterprise Content Management System, TCS Case Study. (http://www.tcs.com/SiteCollectionDocuments/White%20Papers/Knowledge%20Management%20using%20Enterprise%20Content%20Management%20System.pdf)

3. Nonaka, I., takeuchi, H., The Knowledge-creating company: How Japanese.

4. http://www.slideshare.net/somipam1/tata-consultancy-service

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	IT472	Subject Title	Coding Theory						
LTP	2 0 0	Credit	2	Subject Category	DE	Year	4th	Semester	8th

Course Objective:

1. To deeply understand the mathematics of Information Theory and its physical meaning.
2. To understand various Source coding techniques.
3. To understand various channel coding techniques.
4. Can apply the knowledge to real problems in communication application.

Detailed Syllabus

UNIT 1

Entropy, its characterization and related properties, Huffman codes, Shannon-Fano coding, robustness of coding techniques, Information measure-noiseless coding, discrete memoryless channel – channel capacity, fundamental theorem of information theory.

Error correcting codes: minimum distance principles, Hamming bound, general binary code, group code, linear group code Convolution encoding: algebraic structure, Gilbert bound.

(10L)

UNIT 2

Threshold decoding: threshold decoding for block codes Cyclic binary codes: BCH codes, generalized BCH code and decoding, optimum codes, concepts of non-cyclic codes.

Combinatorial Designs: Definitions of BIBD, Hadamard Designs, Latin Squares, Mutually Orthogonal Latin Squares, Orthogonal Arrays. Constructions of codes using designs: Example: Hadamard codes.

(8 L)

UNIT 3

Fundamentals of Network Coding: Butterfly networks, graphs and networks The max-flow min-cut theorem, the multi-source multicast problem, deterministic code design for network coding, randomized network coding, application of network coding. **(8 L)**

Learning Outcome

At the end of the course, Learning Outcomes Having successfully completed this course, the student will demonstrate:

1. Understand and explain the basic concepts of information theory, source coding, channel and channel capacity, channel coding and relation among them.
2. Describe the real life applications based on the fundamental theory.
3. Calculate entropy, channel capacity, bit error rate, code rate, steady-state probability and so on.
4. Implement the encoder and decoder of one block code or convolutional code using any program language

Text book [TB]:

1. J. A. Thomas and T. M. Cover: Elements of information theory, Wiley, 2006.
2. J. H. van Lint: Introduction to Coding Theory, Third Edition, Springer, 1998

Reference books [RB]:

1. F. J. MacWilliams and N.J. Sloane: Theory of Error Correcting Codes, Parts I and II, North-Holland, Amsterdam, 1977.
2. D. Stinson: Combinatorial Designs: Constructions and Analysis, Springer, 2003

3. P. J. Cameron and J. H. van Lint: Designs, Graphs, Codes and their Links, Cambridge University Press, 2010.
4. C. Fragouli and E. Soljanin: Network Coding Fundamentals, Now Publisher, 2007.
5. M. Medard and A. Sprintson, (editors): Network Coding – Fundamentals and Applications, Acadamic Press, 2012.
6. C. Fragouli, J. Le Boudec, J. Widmer: Network coding: An instant primer

Subject Code	CS456	Subject Title	Business Intelligence					
LTP	2 0 0	**Credit**	2	**Subject Category**	DE	**Year**	4th	**Semester**	VIII

COURSE OBJECTIVES:

The objectives of this course is to the comprehensive and in-depth knowledge of Business Intelligence (BI) principles and techniques by introducing the relationship between managerial and technological perspectives. This course is also designed to expose students to the frontiers of BI-intensive BIG data computing and information systems, while providing a sufficiently strong foundation to encourage further research.

Unit I

Introduction to Business Intelligence,

Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities.

(8 L)

Unit II

Basics of Data Integration (**E**xtraction **T**ransformation **L**oading)**,**

Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and application.

(8 L)

Unit III

Introduction to Multi-Dimensional Data Modeling**,**

Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies,

Basics of Enterprise Reporting

Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS

(8 L)

LEARNING OUTCOMES

After completing this course, students will be able to:

1. Identify the major frameworks of computerized decision support: decision support systems (DSS), data analytics and business intelligence (BI).

2. Explanation about the foundations, definitions, and capabilities of DSS, data analytics and BI.

3. Demonstration about the impact of business reporting, information visualization, and dashboards.

Text Book:
1. David Loshin ,Business Intelligence.
2. Mike Biere ,Business intelligence for the enterprise .
3. Larissa Terpeluk Moss, Shaku Atre ,Business intelligence roadmap.

Reference Book:
1. Cindi Howson ,Successful Business Intelligence: Secrets to making Killer BI Applications .
2. Brain, Larson ,Delivering business intelligence with Microsoft SQL server 2008 .

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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 1 Indian Culture: An Introduction   **8Hrs.**
Characteristics of Indian culture, Significance of Geography on Indian Culture; Society in India through ages-Ancient period- Varna and Caste, family and marriage in India, position of women in ancient India, Contemporary period; caste system and communalism.

Unit 2 Indian Languages and Literature   **6 Hrs.**
Evolution of script and languages in India: Harappan Script and Brahmi Script;Short History of the Sanskrit literature: The Vedas, The Brahmins and Upanishads & Sutras, Epics: Ramayana and Mahabharata &Puranas.

Unit 3 Brief History of Indian Arts and Architecture   **6Hrs.**
Indian Art & Architecture: Gandhara School and Mathura School of Art; Hindu Temple Architecture, Buddhist Architecture, Medieval Architecture and Colonial Architecture.
Indian Painting Tradition: ancient, medieval, modern Indian painting and Odishan painting tradition *Performing Arts:* Divisions of Indian classical music: Hindustani and Carnatic, Dances of India: Various Dance forms: Classical and Regional, Rise of modern theatre and Indian cinema.

Unit 4 Spread of Indian Culture Abroad   **6Hrs.**
Causes, Significance and Modes of Cultural Exchange - Through Traders, Teachers, Emissaries, Missionaries and Gypsies,Indian Culture in South East Asia India, Central Asia and Western World through ages

COURSE OUTCOME:
- Understand background of our religion, customs institutions, administration and so on.
- Understand the present existing social, political, religious and economic conditions of the people.
- Analyze relationship between the past and the present relevance of Indian tradition.
- Develop practical skills helpful in the study and understanding of historical events.

TEXT BOOKS
1.Chakravarti, Ranabir: Merchants, Merchandise & Merchantmen, in: Prakash, Om (ed.): The Trading World of the Indian Ocean, 1500-1800 (History of Science, Philosophy and Culture 361 in Indian Civilization, ed. by D.P.Chattopadhaya.
2. Chaudhuri, Kirti N.: Trade and Civilisation in the Indian Ocean, CUP, Cambridge, 1985.
3.Malekandathil, Pius: Maritime India: Trade, Religion and Polity in the Indian Ocean, Primus Books, Delhi, 2010.
4. McPherson, Kenneth: The early Maritime Trade of the Indian Ocean, in: ib.: The Indian Ocean: A History of People and The Sea, OUP, 1993, pp. 16-75.
 5. Christie, J.W., 1995, State formation In early Maritime Southeast Asia, BTLV

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Humanities Electives IV

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, ParamhansYogananda-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). GayatriMahavigyan. Mathura:AkhandJyotiPrakashan.
- Vinoba, Acharya (2011). VicharPothi. Pawnar: ParamdhamPrakaashan.
- Gandhi, M.K. (2013). The story of my experiments with truth. Varanasi: SarvodayaPrakashan.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Humanities Electives IV

Subject Code	HS491	Subject Title	Industrial Sociology						
LTP	2-0-0	Credit	2	Subject Category	Elective	Year	IV	Semester	VIII

Course Objective

- The course attempts to analyze the structure and process of industrial organizations from the sociological perspective.
- The course enables students to have a general view of modern industry.

Unit 1   **7Hrs.**

Industrial Sociology: Nature, Scope and Importance, Origin and Development, Industry as a social, System,Development of Industry in Post-Independence period, Evolution of Working Class, Changing nature of work, Growth of unorganized informal sector., Dynamics of Industrial Relations: Approaches to the study of Industrial Relations, Collective Bargaining,– Concepts, Types, Scope and Importance.

Unit 2   **7Hrs.**

Industrial Disputes: Concept, Features and Kinds of disputes, Settling disputes, Mediation, Arbitration, Conciliation, Negotiation,The Indian Worker: Features of Indian worker, the contribution of social - Philosophy, family, caste and community in determining the attitude of workers

Unit 3   **6Hrs.**

Trade Union: Concept, Features, Functions and Types, History of Trade Union Movement in India Trade Unions and Challenges of Privatization and Globalization; Law and work, Decline of Trade Unions.

Unit 4   **6Hrs.**

Dynamics of Industrial Relations: Corporate Social Responsibility, Inclusion of Women in the Corporate Sector, Scope of Industrial Sociology in India; Impact on Employment, Impact on HRD, impact on wages and benefits, Modern Industry in India

COURSE OUTCOME:

- It will enable students to demonstrate the different human components that make up modern industry.
- The student will get exposed to a specialized area of sociology and its insights.
- Apply sociological concepts and theories to understand contemporary social issues and/or public debates about these issues
- Communicate sociological concepts and/or research in a manner that is appropriate for the intended audience (e.g., academic, lay audience)

TEXT BOOKS

1. Davis, Keith, 1984. Human Behaviour at work, New Delhi. Mcgraw Hill.
2. Gisbert, Ascual S J 1972. Fundamentals of Industrial Sociology, New Delhi, Tata Mc Graw-Hill.
3. Ramaswamy, E. A, 1978. Industrial Relations in India. Delhi. MacMillian
4. Pascal Gilbert: Fundamental of Industrial Sociology; Orient-Longman.
5. E.V.Schneider – Industrial sociology
6. Baviskar et al - Social Structure and Change [Vol.IV] Sage Publishers

REFERENCE BOOKS

- Sheth, N R, 1979, Industrial Sociology in India, Jaipur Rawat.
- Dutt and Sundharam 2007. Indian Economy, S Chand Publications. New Delhi: Publications.
- P. Subha Rao: Human Resource Management and Industrial Relations – Himalaya Publishing House

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Humanities Electives IV

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.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	CS482	Subject Title	Human Computer Interaction						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VIII

Unit 1 (8L)

Introduction: Importance of user Interface–definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface –popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user –Interface popularity, characteristics- Principles of user interface.

Unit 2 (7L)

Design process–Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

Unit 3 (8L)

Screen Designing: Design goals–Screen planning and purpose, organizing screen elements, ordering of screen data and content –screen navigation and flow ,Visually pleasing composition -amount of information -focus and emphasis ,presentation of information simply and meaningfully information retrieval on web - statistical graphics –Technological consideration in interface design.

Unit 4 (8L)

Windows –New and Navigation schemes selection of window, selection of devices based and screen based controls.

Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

Unit 5 (8L)

Software tools –Specification methods, interface–Building Tools.

Interaction Devices – Keyboard and function keys –pointing devices –speech recognition digitization and generation – image and video displays – drivers.

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in Human Computer Interaction, Wiley, 2010.

REFERENCE:

1. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	EC386	Subject Title	Fundamental of Communication & Networks						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	4th	Semester	VIII

Objectives of the Course:
- To understand the concept of Computer Communication.
- To learn the basics of Data communication and Networks
- To develop and design the protocol systems for advance computer communication.

UNIT I: Introduction to Communication:

Communication system, Analog and Digital Communication, channel bandwidth. Ideal and Practical Filters, Concept of Signal Distortion over a Communication Channel, Energy Signal and Power Signal, Introduction to noise in Communication systems.   **6L**

UNIT II: Introduction to Modulation techniques:

Concept of Amplitude Modulation, Concept of Frequency & Phase Modulation, Concept of ASK, FSK & PSK, Concepts of PCM.   **8L**

UNIT III: Introduction to Data Communication Network & OSI Model:

Switching systems, network hardware and software, Layering, design issues for layering, reference models and their comparison, example of networks. Concepts of OSI model.   **6L**

UNIT IV: Introduction to Data Communication Protocols and transmission media

MAC protocols- Aloha, CSMA, collision free protocols, Ethernet, IEEE 802.3 standard, IP protocols, IP addressing, OSPF, IPv4, IPv6. Transmission media and channel impairments, multiplexing, digital channels, switching. Repeaters, bridges, routers and gateways.   **8L**

Text Books:
1. Forouzan, B.A., "Data Communication and Networking", 4th Ed., Tata McGraw-Hill.
2. Tanenbaum, A.S, "Computer Networks", 4th Ed., Pearson Education.
3. Stallings W., "Data and Computer Communication", 8th Ed., Prentice-Hall.
4. Simon Haykins, 'Communication Systems', John Wiley,5th edition

Reference Books:

1. Kurose, J.F. and Ross, K.W., "Computer Networking: A Top-Down Approach Featuring the Internet", 3rd Ed., Addison Wesley.

List of Experiments:
1. To generate amplitude modulated wave and determine the percentage modulation and Demodulate the modulated wave using envelope detector.
2. To generate AM-Double Side Band Suppressed Carrier (DSB-SC) signal.
3. To generate the SSB modulated and Demodulated wave.
4. To generate frequency modulated signal and determine the modulation index and bandwidth for various values of amplitude and frequency of modulating signal and to demodulate a FM signal
5. To study ASK modulation and Demodulation.
6. To study FSK modulation and Demodulation.
7. To study PSK modulation and Demodulation.
8. To Study TDM/PCM Transmitter /Receiver.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

OUTCOMES OF THE COURSE:

The course provides an understanding of:

- Computer Communication and networks.
- Protocol design and their design issues.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	EC382	Subject Title	Biomedical Instrumentation						
LTP	3 0 0	Credit	3	Subject Category	DE /OE	Year	4th	Semester	VIII

Objectives of the Course: The students will learn
- Requirement of bio-medical and its application
- Concept of bio-potential electrodes and measurements related to them.
- Concepts of bio-transducers and measurements related to them.
- Concept of bio-medical instruments and their uses experimentally.

UNIT I: ANATOMY AND PHYSIOLOGY:
Basic Cell Functions, Origin of Bio-potentials, Electrical Activity of Cells, components of man Instrument system, types of bio-medical stems, design factors and limitations of biomedical instruments, terms and transducers to various physiological events.   **8L**

UNIT II: BIO-POTENTIAL ELECTRODE:
Types of bio-potential electrodes., Electrode-Electrolyte interface, half cell potential, Polarization- polarisable and non-polarisable electrodes, Ag/AgCl electrodes, Electrode circuit model; Electrode and Skin interface and motion artifact. Body surface recording electrodes for ECG. Electrodes standards.   **8L**

UNIT III: BIO-TRANSDUCER:
Transduction Principles: Resistive Transducers Strain Gauge- types, construction, selection materials, Gauge factor, Bridge circuit, Temperature compensation. Strain Gauge type Blood pressure transducers. Inductive Transducers, Capacitive Transducer, Piezoelectric Transducer.   **8**

UNIT IV: BIOTELEMETRY AND ELECTRICAL SAFETY:
Bio-telemetry design, single channel bio telemetry transmitter and receiver system based on AM, FM and, pulse modulation. Significance of Electrical Danger, physiological effect of current, ground shock Hazards.   **8L**

Text Books:
1. Joseph J. Carr & John. M. Brown, 'Introduction to Biomedical Equipment technology'
2. R.S. Khandpur, 'Handbook of Biomedical Instrumentation', McGraw Hill.

Reference Books:
1   J.G. Webster, 'Medical instrumentation application and design', Houghton Miffin Co., Boston USA.
2   Mohan Murali H, 'Monograph on Biomedical engineering', O.U. Press 1985.
3   Geddes L. A. & L. E. Baker, 'Principles of Applied Biomedical Instrumentation', Wiley, 1989.
4   Leslie Cromwell, Fred J. Weibell and Erich A. Pfeiffer, 'Biomedical Instrumentations and Measurements' (2nd edition), PHI, 1991.

OUTCOMES OF THE COURSE:
The course provides an understanding of:
- Bio-medical instruments and measurements.
- Principle of working of bio-medical transducers.
- Skills to use modern bio-medical tools and equipment for measurements related to human body.

LIST OF EXPERIMENTS
   2. Pulse measurement
   3. Heartbeat measurement

4. Automatic BP measurement
5. Heart sound study using electronics stethoscope
6. ECG measurement

Following experiments to be done on the breadboard
7. Design of low noise and low frequency amplifier for biomedical application
8. Design of Instrumentation amplifier
9. Construction of chopper amplifier

Two Value Added Experiments to be added by Instructor.

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.**

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.

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.

Subject Code	ME452	Subject Title	Renewable Energy Sources						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VIII

Course Objective: To provide students an overview of global energy resources with focus on renewable energy sources and their importance in the context of limited supply of conventional energy resources & global warming.

Course Pre/Co- requisite (if any): Basic Thermodynamics, Heat Transfer

Detailed Syllabus

UNIT 1: ENERGY RESOURCES
Introduction: Energy & its importance in social & economic development; energy demand & supply, world energy status, energy scenario in India; energy & environment, greenhouse effect & global warming; role of renewable energy sources; a brief introduction to various renewable energy sources – hydro, solar, biomass, wind, geothermal & ocean energy – their availability & present status.

UNIT 2: SOLAR ENERGY
The sun as a source of energy, extraterrestrial & terrestrial solar radiation; solar radiation data & geometry, solar radiation on horizontal & inclined surfaces; solar thermal systems – various types of solar collectors & their applications in cooking, drying, water heating, distillation, space heating & cooling, refrigeration and power generation.
Solar photovoltaic systems, solar cell fundamentals, performance & characteristics, types of solar cells; solar cell, module, and array construction; solar PV applications.

UNIT 3: BIOMASS ENERGY
Origin of biomass, photosynthesis & generation of biomass, availability of biomass, usable forms of biomass – fuel wood, charcoal, fuel pellets, biodiesel, bioethanol, biogas and producer gas; biomass conversion technologies, thermochemical & biochemical methods, biomass gasification, classification & operational parameters of biogas plants, energy recovery from urban waste, sewage to energy conversion.

UNIT 4: WIND ENERGY
Origin & nature of winds; history of power from winds; global & local winds; estimation of wind energy at a site; maximum power extraction from wind – Betz criterion; capacity factor of wind power plants; types of wind turbines – horizontal and vertical axis wind turbines; wind energy storage; environmental & economic aspects; present status of wind energy systems.

UNIT 5: GEOTHERMAL & OCEAN ENERGY
Structure of earth's interior; origin & distribution of geothermal energy, types of geothermal resources – exploration & development of hydrothermal, geo-pressured & hot dry rock resources; electrical power generation from geothermal energy; environmental & economic considerations.
Ocean energy; tidal, wave & ocean thermal energy, energy from tidal streams (marine currents); technology for harnessing tidal & wave energy; ocean thermal energy conversion technology.

Learning Outcome

At the end of the course the student will:
CO1: Understand about the interaction between energy, economy, environment, and social development.
CO2: Appreciate the importance of renewable energy sources & future energy systems based on them.
CO3: Possess the basic technical knowledge to develop energy systems based on solar, biomass, wind, geothermal & ocean energy.
Text book [TB]:

1. B. H. Khan, "Non-Conventional Energy Resources", 3rd edition (2017), McGraw Hill Education (India) Private Limited, Chennai.
2. S. P. Sukhatme& J. K. Nayak,"Solar Energy", 4th edition (2018), McGraw Hill Education (India) Private Limited, Chennai.

References [RB]:

1. G. N. Tiwari & M. K. Ghosal, "Renewable Energy Resources – Basic Principles and Applications", 2005, Narosa Publishing House, New Delhi.
2. D.P. KOTHARI, K. C. SINGAL, RAKESH RANJAN, Renewable Energy Sources And Emerging Technologies, PHI Learning Pvt. Ltd., 25-Nov-2011.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

Subject Code	CE483	Subject Title	GIS						
LTP	3 0 0	Credit	3	Subject Category	DE/OE	Year	4th	Semester	VIII

Course Objective: The course provides wide knowledge about basics of GIS and its applications in various fields

Unit-1: Introduction

8L

Definition of GIS, Cartography and GIS, GIS database: spatial and attribute date; Spatial models: Semantics, spatial information, temporal information, conceptual models of spatial information, representation of geographic information: point, line and area futures, topology,

Unit-2: Components

12L

Raster and vector data, raster to vector data conversion, map projection, analytical transformation, rubber sheet transformation, manual digitizing and semi-automatic line following digitizer; Remote sensing data as an input to GIS data;

Unit-3: Classifications and Functions

10L

Attribute database: scale and source of inaccuracy; GIS functionality; data storage and data retrieval through query, generalization, classification, containment search within a spatial region;

Unit-4: Analysis

5L

Overlay: arithmetical, logical and conditional overlay, buffers, inter visibility, aggregation; Network analysis;

Unit-5: Applications

4L

Applications of GIS in planning and management of utility lines and in the filed of environmental engineering, geotechnical engineering, transportation engineering and water resources engineering.

Course Outcome: The students will learn from this course:
- Basic understanding of GIS concepts, components.
- Analyzing geo-spatial data with various techniques and GIS tools
- Apply the concepts in solving environmental and engineering problems
- Create new information and theoretical knowledge after applying GIS tools

Books Recommended:
1. Geographic Information Systems: A Management Perspective, by Stan Arnoff, WDL Publications.
2. Fundamentals of Spatial Information Systems by Robert laurini and Derek Thompson, Academic Press.
3. Geographical Information Systems, Vol. I and II edited by Paul Longely, M.F. Good child, et.al, John Wiley and Sons, Inc. 1999

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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 CO_2 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 CO_2.
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 CO_2, Carbon dioxide recycling.

UNIT 4
Carbon dioxide sequestration: Underground storage, Potential for Geologic Storage, Application in Oil and gas industry, Carbon di oxide flooding projects, Methane recovery projects.

UNIT 5
Strategy for implementing CCS technology: Modelling of Cost and Performance of CCS Plants. Role and function of IPCC.

Text book [TB]:

1. Carbon Capture; Jennifer Wilcox; Springer
2. Capturing Carbon – The new weapon in the War Against Climate Change; Mills, Robin M.; Columbia University Press

Reference books [RB]:

1. Piping and pipeline engineering, George A. Antaki, Marcel Dekker Inc. New York.
2. Fundamentals of pipeline engineering by J. Vincent Genod, Technip Editions

5. **Teaching and Learning Strategy**

   All materials (ppts, assignments, labs, etc.) will be uploaded in Moodle. Refer to your course in Moodle for details.

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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.

Code	AR-485	Subject Title	ART APPRECIATION					
LTP	3 0 0	Credit	3	Subject Category	OE	Year	4th	Semester	VIII

Course Objective:

To create an overview and understanding of various art forms that exists from ancient to modern times.

Unit 1: INTRODUCTION

Understanding various art forms in society and in different cultures.

Unit 2: Sociological Perspective

Relationship between art, culture and society. Influence of art forms on people.

Unit 3: Appreciation-I: Painting/ Sculptures

Understanding and appreciating films/ documentaries from past to present timesand between east and west

Unit 4: Appreciation-II: Films/ Documentries

Understanding and appreciating painting and sculptures from past to present times and between east and west

Unit 5: Appreciation-III: Indigenous/ Folk Art

Understanding and appreciating Indigenous/ Folk art from past to present times and between east and west.

LEARNING OUTCOME:
4. The student will be able to understand the various art forms.
5. The students will be able to understand and establish a relationship between art, culture and society.
6. The students will be able to appreciate the various art.

Text Books:
3. Creative Authenticity: 16 Principles to Clarify and Deepen Your Artistic Vision, Ian Roberts

Reference Books:

The Writer: A Concise Complete and Practical Text Book of Rhetoric. Designed to Aid in The Appreciation, George Lansing Raymond

Course Structure of B.Tech – Information Technology Applicable from 2018-2022 Batch

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.