R V R & J C COLLEGE OF ENGINEERING, CHOWDAVARAM, GUNTUR-19

(Autonomous)(w.e.f. the academic year 2018-2019)

B.Tech., Computer Science & Engineering

Semester I (First Year)

S.No.	CODE.NO	SUBJECT	SCHEME OF INSTRUCTION PERIODS PER WEEK			Scheme of examination			Category Code
			L	T	P	INT	EXT	CREDITS	
1	CS/IT 111	Mathematics – I	3	1	-	40	60	4	BS
2	CS/IT 112	Engineering Physics	3	1	-	40	60	4	BS
3	CS/IT/EC 113	Basic Electrical Engineering	3	1	-	40	60	4	ES
4	CS/IT 151	Physics Lab	-	-	3	40	60	1.5	BS
5	CS/IT/EC 152	Basic Electrical Engineering Lab	-	-	2	40	60	1	ES
6	CS/IT/CH/EC 153	Engineering Graphics and Design Lab	1	-	4	40	60	3	ES
7	MC 000	Three Weeks Orientation Program	--	--	--	--	--	--	--
8	CS V02	Introduction to Computing	2	-	-	100	-	-	VC
Total			12	3	9	340	360	17.5	TPW-24

Semester II (First Year)

S.No.	CODE.NO	SUBJECT	Scheme of Instruction periods per week			Scheme of examination			Category Code
			L	T	P	INT	EXT	CREDITS	
1	CS/IT 121	Mathematics – II	3	1	-	40	60	4	BS
2	CS/CE/IT 122	Engineering Chemistry	3	1	-	40	60	4	BS
3	CS/CE/CH/IT/EE/ EC/ME 123	Programming for Problem Solving	3	-	-	40	60	3	ES
4	CS/CH/IT/EC 124	English for Communication Skills	2	-	-	40	60	2	HS
5	CS/CE/IT 161	Chemistry Lab	-	-	3	40	60	1.5	BS
6	CS/CE/CH/IT/EE/ EC/ME 162	Programming for Problem Solving Lab	-	-	4	40	60	2	ES
7	CS/CH/IT/EC 163	Workshop Practice Lab	1	-	4	40	60	3	ES
8	CS/CH/IT/EC 164	English Language Communication Skills Lab	-	-	2	40	60	1	HS
9	MC 002	Environmental Science	2	-	-	100	-	-	MC
10	CS V01	English Competency Development Program	2	-	-	100	-	-	VC
Total			16	2	13	520	480	20.5	TPW-31

Semester III (Second Year)

S.No.	CODE.NO	SUBJECT	Scheme of Instruction periods per week			Scheme of examination			Category Code
			L	T	P	INT	EXT	CREDITS	
1	CS/IT 211	Mathematics – III	3	1	-	40	60	4	BS
2	CS/IT 212	Life Sciences For Engineers	2	-	-	40	60	2	BS
3	CS/IT 213	Digital Electronics	3	-	-	40	60	3	ES
4	CS/IT 214	Discrete Mathematics	3	-	-	40	60	3	PC
5	CS/IT 215	Data Structures	3	-	-	40	60	3	PC
6	CS/IT 216	Object Oriented Programming	3	-	-	40	60	3	PC
7	CS/IT 251	Digital Electronics Lab	-	-	2	40	60	1	ES
8	CS/IT 252	Data Structures Lab	-	-	4	40	60	2	PC
9	CS/IT 253	Object Oriented Programming Lab	-	-	2	40	60	1	PC
10	MC 001	Constitution of India	2	-	-	100	-	-	MC
11	MC 004	Design Thinking and Product Innovation	2	-	-	100	-	-	MC
Total			21	1	8	560	540	22	TPW-30

Semester IV (Second year)

S.No.	CODE.NO	SUBJECT	Scheme of Instruction periods per week			Scheme of examination			Category Code
			L	T	P	INT	EXT	CREDITS	
1	CS/IT 221	Computer Organization	3	-	-	40	60	3	PC
2	CS/IT 222	Operating Systems	3	-	-	40	60	3	PC
3	CS/IT 223	Database Management Systems	3	-	-	40	60	3	PC
4	CS/IT 224	Formal Languages & Automata Theory	3	-	-	40	60	3	PC
5	CS/IT 225	Humanities (Elective-I)	3	-	-	40	60	3	HE
6	CS/IT 226	Open Elective - I	3	-	-	40	60	3	OE
7	CS/IT 261	Operating Systems Lab	-	-	4	40	60	2	PC
8	CS/IT 262	Database Management Systems Lab	-	-	4	40	60	2	PC
9	MC 003	Essence of Indian Traditional Knowledge	2	-	-	100	-	-	MC
10	CS V04	Programming with Python	2	-	2	100	-	-	VC
Total			22	0	10	520	480	22	TPW-32

Semester V (Third year)

S.No.	CODE.NO	SUBJECT	Scheme of Instruction periods per week			Scheme of examination			Category Code
			L	T	P	INT	EXT	CREDITS	
1	CS/IT 311	Computer Networks	3	-	-	40	60	3	PC
2	CS/IT 312	Design & Analysis of Algorithms	3	-	-	40	60	3	PC
3	CS/IT 313	Web Technologies	3	-	-	40	60	3	PC
4	CS/IT 314	Software Engineering	3	-	-	40	60	3	PC
5	CS/IT 315	Professional Elective-I	3	-	-	40	60	3	PE
6.	CS/IT 316	Open Elective - II	3	-	-	40	60	3	OE
7.	CS/IT 351	Design & Analysis of Algorithms Lab	-	-	4	40	60	2	PC
8	CS/IT 352	Web Technologies Lab	-	-	4	40	60	2	PC
9.	CS/IT 353	Software Engineering Lab	-	-	4	40	60	2	PC
Total			18	0	12	360	540	24	TPW-30

Semester VI (Third year)

S.No.	CODE.NO	SUBJECT	Scheme of Instruction periods per week			Scheme of examination			Category Code
			L	T	P	INT	EXT	CREDITS	
1	CS/IT 321	Compiler Design	3	-	-	40	60	3	PC
2	CS/IT 322	Data Engineering	3	-	-	40	60	3	PC
3	CS/IT 323	Artificial Intelligence	3	-	-	40	60	3	PC
4	CS/IT 324	Cryptography & Network Security	3	-	-	40	60	3	PC
5	CS/IT 325	Professional Elective-II	3	-	-	40	60	3	PE
6	CS/IT 326	Open Elective – III	3	-	-	40	60	3	OE
7	CS/IT 361	Artificial Intelligence Lab	-	-	4	40	60	2	PC
8	CS/IT 362	Project-I	-	-	4	40	60	2	PR
9	CS/IT 363	Term Paper	-	-	4	100	-	2	PR
Total			18	0	12	420	480	24	TPW-30

Semester VII (Final year)

S.No.	CODE.NO	SUBJECT	Scheme of Instruction periods per week			Scheme of examination			Category Code
			L	T	P	INT	EXT	CREDITS	
1	CS/IT 411	Machine Learning	3	-	-	40	60	3	PC
2	CS/IT 412	Neural Networks	3	-	-	40	60	3	PC
3	CS/IT 413	Professional Elective-III	3	-	-	40	60	3	PE
4	CS/IT 414	Professional Elective- IV	3	-	-	40	60	3	PE
5	CS/IT 415	Humanities (Elective-II)	3	-	-	40	60	3	HE
6	CS/IT 451	Machine Learning Lab	-	-	2	40	60	1	PC
7	CS/IT 452	Project-II	-	-	4	40	60	2	PR
Total			15	0	6	280	420	18	TPW-21

Semester VIII (Final year)

S.No.	CODE.NO	SUBJECT	Scheme of Instruction periods per week			Scheme of examination			Category Code
			L	T	P	INT	EXT	CREDITS	
1	CS/IT 421	Professional Elective-V(MOOCS)	3	0	-	-	100	3	PE
2	CS/IT 422	Open Elective-IV(MOOCS)	3	0	-	-	100	3	OE
3	CS/IT 461	Project-III	-	-	12	40	60	6	PR
Total			6	0	12	40	260	12	TPW-18

Open Elective Courses (Offered by CSEDepartment):

CODE NO.	SUBJECT NAME	CODE NO.	SUBJECT NAME
CSOL01	Programming with Java	CSOL02	Relational Database Management System
CSOL03	Introduction to Python Programming	CSOL04	Internet Of Things

Value Added Courses

CODE NO.	SUBJECT NAME	CODE NO.	SUBJECT NAME
CS V001	English Competency Development Program	CS V002	Introduction To Computing
CS V004	Programming with Python		

PROFESSIONAL ELECTIVE COURSES:

CODE NO.	SUBJECT NAME	CODE NO.	SUBJECT NAME
Professional Elective Courses for III/IV B.Tech.		Professional Elective Courses for IV/IV B.Tech.	
CSEL01	Unix Programming	CSEL14	Advanced Computer Architecture
CSEL02	Interactive Computer Graphics	CSEL15	Design and Analysis of Parallel Algorithms
CSEL03	Big Data Analytics	CSEL16	.NET Technologies
CSEL04	Embedded Systems	CSEL17	Semantic Web
CSEL05	Open Source Systems	CSEL18	Wireless Networks
CSEL06	Digital Image processing	CSEL19	Cloud Computing
CSEL07	Network Programming	CSEL20	Quantum Computing
CSEL08	Mobile Application Development	CSEL21	Natural Language Processing
CSEL09	Internet of Things	CSEL22	Virtual Reality
CSEL10	Object Oriented Analysis and Design(OOAD)	CSEL23	Cyber Security
CSEL11	Distributed Computing	CSEL24	BlockChain Technology
CSEL12	Principles of Programming Languages(PPL)	CSEL25	Multi-Core Technologies
CSEL13	* Industry RecommendedCourse	CSEL26	* Industry RecommendedCourse
NOTE: Students Are Allowed To Take Professional Electives From 1 To 13 During III/IVB.Tech and 14 To 26 During IV/IV B.Tech Course * To be decided based on Industry Recommendations			

Management Elective Courses

CODE NO.	SUBJECT NAME	CODE NO.	SUBJECT NAME
HSEL01	Introduction To Industrial Management	HSEL02	Economics For Engineers
HSEL03	Human Resources Behaviour And Organization Behaviour	HSEL04	Project Management And Entrepreneurship

Semester I (First year)

CS/IT 111	Mathematics-I	L	T	P	C
		3	1	0	4

Course Objectives:

The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more a level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes:

The students will able to:

1. Evaluate certain improper integrals apart from some other applications they will have a basic understanding of Beta and Gamma functions.
2. Know fallouts of Role's theorem that is fundamental to application of analysis to Engineering problems.
3. Understand linear algebra including linear transformations in a comprehensive manner.
4. Find matrix Eigen values and know diagonalization and orthogonalization.

Course Content:

UNIT I Text Book-1 15 Periods

Evolutes and Involutes, Evaluation of improper integrals: Integrals without infinite limits of integration, Beta function, Gamma function, Relation between beta and gammafunctions (without proof) Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT II Text Book-1 15 Periods

Rolle's theorem(without proof), Lagrange's mean value theorem(without proof), Taylor's and Maclaurin series, Sequences, Series, Series of positive terms, Convergence tests: Comparisontest(limit form) D'Alembert's ratio test, Raabe's test for convergence.

UNITIII Text Book-2 15 Periods

Vectors: addition and scalar multiplication, linear dependence and independence of vectors.
Vector space, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank nullity theorem, composition of linear maps, Matrix associated with a linear map.

UNIT IV Text Book-2 15 Periods

Characteristic equation, Eigen values and eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, Eigenbasis, Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Learning Resources:

Text Books:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd edition.
2. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson, 2002.
2. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
3. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.

CS/IT 112	Engineering Physics	L	T	P	C
		3	1	0	4

Course Objectives:

1. Introducing the concept of electron motion in periodic potentials and classification of solids, band formation by learning the prerequisite quantum physics.
2. Explaining the diode equation and formation of P-N junction from the basics of semiconductors.
3. Understanding the interaction of radiation with bulk semiconductors and the relevant Optoelectronic devices with energy band diagrams.
4. Exploring the applications of devices in low dimensional materials by understanding the density of states and experimental techniques to be used for measurement of transport properties.

Course Outcomes:

After successful completion of the course, the student will be able to understand:

1. Necessity of periodical potentials and conditions for explaining the properties and band formation with the help of quantum physics.
2. The theory of P-N junction diode from the basics of semiconductor concepts.
3. The theory and application of Optoelectronic devices.
4. Measurement techniques employed in transport phenomena and variation of properties in low dimensions.

Course Content:

UNIT I 15 Periods

Introduction to Quantum mechanics: Wave nature of particles, deBroglie hypothesis, Davission – Germer experiment, Time dependent and Time independent Schrodinger wave equations, Physical significance of wave function, Uncertainty principle, Single slit experiment. Solution to stationary state problem: particle in a box, and extension to 3-D box (qualitative treatment only).

Electronic Theory of materials: Salient features of Free electronic theory, Fermi – Dirac distribution function, Fermi level, Density of States, Bloch wave function, Kronig-Penney model, E-K curves, Brillouin zones, Effective mass, Degree of freedom of electron - Distinction of metals and insulators. Concept of hole, Energy band formation in solids.

UNIT II 15 Periods

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, drift and diffusion equations, Einstien's relation, p-n junction formation, diode equation,Hall effect and applications.

UNIT III 15 Periods

Direct and Indirect band gap semiconductors, Light-semiconductor interaction: Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission, Optical loss and gain; Density of states for photons, Semiconducting laser, Homo and Hetrostructure lasers with band diagrams, characteristics of laser and LED, PIN diode, Solar cell, working principle and characteristics.

UNIT IV 15 Periods

Density of states in 2D, 1D and 0D (qualitatively), Practical examples of low-dimensional systems such as quantum wells, wires, and dots. Four-point probe and vanderPauw measurements for carrier density, resistivity, and Hallmobility, Hot-point probe measurement, capacitance-voltage measurements, Parameter extraction from Diode I-V characteristics.

Learning Resources:

Text Book:

1. M.N. Avadhanulu, P.G. Kshirasagar - A Text Book of Engineering Physics, S. Chand & Company Ltd.2018

Reference Books:

1. Donald A.Neeman - Semiconductor Physics and Devices : Basic Principle (Fourth edition), TMH, 2012.
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
3. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
4. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
5. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications,Oxford University Press, New York (2007).
6. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).

Web References:

1. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL.
2. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL.

CS/IT/EC 113	Basic Electrical Engineering	L	T	P	C
		3	1	0	4

Course Objectives:

The main objectives of this course are

1. To introduce fundamental laws, basic electrical elements, sources and their characteristics.
2. To develop the ability to apply circuit analysis to AC circuits
3. To provide students with fundamental concepts on the construction and operation of transformers and electrical machines.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

1. Understand the basic electrical circuits and batteries.
2. Gain the knowledge on the concept of AC circuits.
3. Get the knowledge on the principle and operation of single phase transformer
4. Understand the operation of electrical machines.

Course Content:

UNIT I 15 Periods

DC Circuits:
Batteries: Lead-acid, Nickel-iron, Nickel-Cadmium batteries (Operation only). Elementary calculations for energy consumption.
DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

UNIT II 15 Periods

AC Circuits:
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III 15 Periods

Transformers:
Magnetic materials, BH characteristics, working principle of single phase transformer, ideal and practical transformer, equivalent circuit form O.C and |S.C tests. Losses in transformers, regulation and efficiency. Auto-transformer-Working principle, comparison with two winding transformer.

UNIT IV 15 Periods

Electrical Machines:
Construction, working principle of DC generator and motor(Elementary treatment only), torque-speed characteristic of separately excited dc motor. Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency. Construction and working of synchronous generators.

Learning Resources:

Text Books:

1. T.K.Nagasarkar and M.S.Sukhija – Principles of Basic Electrical Engineering, Oxford University Press, 2018.
2. D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill,2010.

Reference Books:

1. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press,2011.
3. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
4. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
5. J.B Gupta ,Basic Electrical Engineering, S.K.Kataria& Sons, 6th Edition 2015

Web References:

1. http://www.egate.ws/
2. http://cosmolearning.org/courses/circuit-theory/
3. http://www.nptelvideos.in/2012/11/circuit-theory.html
4. http://elearning.vtu.ac.in/P9/notes/06ES34/Unit1-KCV.pdf
5. http://pbtstudies.blogspot.in/

CS/IT 151	Physics Lab	L	T	P	C
		0	0	3	1.5

Course Objectives:

The aim and objective of the Lab course on Physics is to introduce the students of B.Tech. class to the formal structure of Physics so that they can use these in Engineering as per their requirement.

Course Outcomes:

At the end of the course, the student will be:
1. Able to use CRO, Function generator, Spectrometer for making measurements.
2. Able to test the optical instruments using principles of interference and diffraction.
3. Able to understand the concepts learned in the Physics theory.
4. Trained in carrying out precise measurements and handling sensitive equipment.
5. Learn to draw conclusions from data and develop skills in experimental design

(Any 10 out of the following experiments)

1. Measurements using Vernier Calipers, Screw Gauge and Spherometer
2. Newton's rings - Measurement of radius of curvature of plano-convex lens
3. Determination of Energy band gap of a Semiconductor
4. Optical fibers – Determination of Numerical Aperture
5. Diffraction grating - Measurement of wavelengthsusing Spectrometer
6. Magnetic field in Helmholtz coil
7. PhotoVoltaic Cell – Determination of fill factor
8. Series LCR resonance circuit –Determination of Q - factor
9. Four probe method apparatus for measurements of resistivity and conductivity
10. Determination of wavelengths using diffraction grating
11. Variation of magnetic field along the axis of a circular current carrying coil
12. Carey Foster's bridge – Determination of Specific Resistance

Reference Book:

Physics Lab Manual: RVR & JCCE, Guntur

Note: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

CS/IT/EC 152	Basic Electrical Engineering Laboratory	L	T	P	C
		0	0	2	1

Course Objectives:

The main objectives of this lab course are

1. To conduct experiments on electrical circuits.
2. To design experimental setups for theorems.
3. To know the response of electrical circuits for different excitations

Course Outcomes:

Upon completion of this laboratory, the student will be able to:

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of resonance.
5. Verify the network theorems.

List of experiments/demonstrations:

1. Familiarization of Electrical Installations and Electrical Testing Equipment: Miniature circuit breakers (MCBs), Moulded Case Circuit Breakers (MCCBs), Earth-leakage circuit breakers (**ELCBs**), Fuses, Types of Wires, Wire Gauges, continuity test, megger, Cables and Earthing.
2. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, wattmeter, multi-meter, oscilloscope, measurement of basic parameters.
3. Verification of KVL& KCL.
4. Verification of Superposition Theorem.
5. Verification of Thevenin's Theorem.
6. Verification of Norton's Theorem.
7. Transformers: Observation of the no-load current waveform on an oscilloscope (non sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics).
8. OC & SC tests on single phase transformer.
9. Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
10. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement).
11. Swinburne's test on dc motor.
12. Speed control of dc motor.
13. Experiments on three-phase induction motors. Direction reversal by change of phase-sequence connections, Torque-Slip Characteristics of an induction motor.
14. Synchronous Machine operating as a generator: stand-alone operation with a load, control of voltage through field excitation.
15. Determination of choke coil parameters.

Note: A minimum of 10(Ten) experiments have to be Performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

CS/IT/CH/EC 153	Engineering Graphics & Design Lab	L	T	P	C
		1	0	4	3

Course Objectives:

The course will enable the students to

1. Expose the students to standards and conventions followed in preparation of engineering drawings.
2. Make them understand the concepts of orthographic and isometric projections
3. Develop the ability of conveying the engineering information through drawings.
4. Make them understand the relevance of engineering drawing to different engineering domains.
5. Develop the ability of producing engineering drawings using drawing instruments.
6. Enable them to use computer aided drafting packages for the generation of drawings.

Course Outcomes:

Upon completion of this course, students will be able to

1. Prepare engineering drawings as per BIS conventions mentioned in the relevant codes.
2. Produce computer generated drawings using CAD software.
3. Use the knowledge of orthographic projections to represent engineering information / concepts and present the same in the form of drawings.
4. Develop isometric drawings of simple objects reading the orthographic projections of those objects.
5. Convert pictorial and isometric views of simple objects to orthographic views.

(**UNIT I to IV** shall be taught in conventional drawing method and Unit V shall be taught with the aid of computer)

UNITI

General: Principles of Engineering Graphics and their significance, usage of drawing instruments, lettering.

Conic sections: Construction of Ellipse, Parabola, Hyperbola and Rectangular Hyperbola. (General method only)

Curves: Cycloid, Epicycloid, Hypocycloid and Involute; and **Scales**

UNIT II

Method of Projections: Principles of projection - First angle and third angle projection of points, Projection of straight lines inclined to both planes. Traces of lines.

Projections of planes: Projections of planes inclined to both the planes, projections on auxiliary planes.

UNIT III

Projections of Regular Solids: Projections of solids (Prism, Pyramid, Cylinder and Cone) with varying positions.

Sections of Solids: Sections of Prisms, Pyramids, cylinders and Cones. True shapes of sections. (Limited to the cutting plane perpendicular to one of the principal plane).

Development of surfaces: Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT IV

Isometric Projections: Principles of Isometric projection-Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids

Orthographic Projections: Conversion of pictorial views into Orthographic views and Vice-versa. (Treatment is limited to simple castings).

Perspective Projections: Introduction to Perspective Projection

UNIT V

Over view of Computer Aided drafting (AutoCAD): Introduction, starting and customizing AutoCAD screen, usage of different menus, toolbars(drawing, editing, dimension, text, object properties..etc), tabs (Object, snap, grid, polar, ortho, otrack..etc) and command prompt. Setting units, limits, layers and viewports (Isometric, Top, Front, back..etc). 2D drawings of various mechanical and structural components, electrical and electronic circuits. Orthographic and Isometric views of mechanical castings and simple structures.

Learning Resources:

Text Book:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House.

Reference Books:

1. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
2. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
3. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
4. (Corresponding set of) CAD Software Theory and User Manuals

		L	T	P	C
MC 000	**Three Weeks Orientation Program**	**0**	**0**	**0**	**0**

CS V02	Introduction to Computing Mandatory Course	L	T	P	C
		2	0	0	0

Course Objectives:

1. Students will be able to gain in – depth understanding of problem.
2. Students will be able to evaluate different concepts and methods in a computer language.
3. Students will be able to analyze and develop an algorithm for a given problem.
4. Students will be able to apply their knowledge to design and develop Computer solution to real world problems.

Course Outcomes:

1. The student will learn the algorithm and flowchart.
2. The student will learn to formulate fundamental algorithms for logical problems.
3. The student will be able to develop an algorithm using Factoring Methods.
4. The student will be able to design an algorithm using array related problems.

Course Content:

UNIT I 8 Periods

Introduction: Computer & its Components, Algorithm, Characteristics of algorithm, Flowchart, Symbols are used in flowchart.

UNIT II 8 Periods

Fundamentals of Algorithms: Introduction, Exchanging the values of two variables, Counting, Summation of a set of numbers, Factorial computation, Sine function computation, Generation of the Fibonacci sequence, Reversing the digits of an integer, Base conversion, Character to number conversion.

UNIT III 8 Periods

Factoring Methods: Introduction, Finding the square root of a number, the smallest divisor of number, the greatest common devisor of two numbers, generating prime numbers, computing the prime factors of an integer, Generation of pseudo-random numbers, raising a number to large power, computing the n^{th} Fibonacci number.

UNIT IV 8 Periods

Array Techniques: Array order reversal, Array counting or histogramming, Finding the maximum number in a set, Removal of duplicates from an ordered array, Partitioning an array.

Learning Resources:

Text Book:

1. R G Dromey, How to Solve it by Computer, PHI. C.A.R.HOARE SERIES EDITOR (Chapters 2 - 4).

Semester II (First year)

CS/IT 121	Mathematics-II	L	T	P	C
		3	1	0	4

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and differential equations. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes:

The students will be able to:
1. Deal with functions of several variables that are essential in most branches of engineering.
2. Evaluate multiple integrals.
3. Understand concepts like divergence, curl and integration of vector function.
4. Solve differential equations which model physical processes.

Course Content:

UNIT I 15 Periods

Multivariable Calculus: Limit, continuity and partial derivatives, total derivative
Maxima, minima and saddle points of two variables, Method of Lagrange multipliers

UNIT II 15 Periods

Multiple Integrals: Double integrals (Cartesian and polar), change of order of integration, change of variables (Cartesian to polar), area by double integration, triple integrals, volume by triple integrals.

UNIT III 15 Periods

Scalar and vector point functions, Gradient, directional derivative, divergence and curl, del applied twice to point and product of point functions (without proofs)Vector integration: line integral, surface and volume integrals, Green's theorem(without proof), Stoke's theorem(without proof), Gauss divergence theorem(without proof)

UNIT IV 15 Periods

First order ordinary differential equations: Linear, Bernouli and exact equations Second order ordinary linear equations: Solution by method of variation of parameters,Cauchy's equation, Power series solutions; Legendre polynomials, Besselfunctions of the first kind and their properties

Learning Resources:

Text Book:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42nd edition.

Reference Books:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, LaxmiPublications, Reprint, 2010.
2. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.

CS/CE/IT 122	Engineering Chemistry	L	T	P	C
		3	1	0	4

Course Objectives:

1. It imparts concepts involved in molecular structure and intermolecular forces.
2. Understands the chemistry behind electrochemical energy systems.
3. Students understand the chemical concepts involved in Water treatment and Corrosion.
4. Student shall know about the major organic reactions and end products like conducting polymers.
5. Learn analytical methods useful in characterization of compounds.

Course outcomes:

1. Student can identify stable complexes and suitable electrochemical energy systems for end usage.
2. Student can apply his knowledge for effective water treatment and corrosion prevention.
3. Able to identify chemical reactions that are used in the synthesis of molecules and polymers
4. Distinguish the ranges of the electromagnetic spectrum and characterize a given compound using analytical techniques.

Course Content:

UNIT I 15 Periods

Molecular structure, Intermolecular forces and Energy systems:
Crystal field theory-salient features, energy level diagrams-tetrahedral and octahedral complexes, crystal field stabilization energies and magnetic properties.

Ionic, dipolar, Vander Waal's interaction and Hydrogen bonding, critical phenomena-Andrew's isotherms of CO_2, derivation of critical constants from Vander Waal's equation.
Electrode potential, electrochemical series, Nernst equation and its applications. Batteries-Primary (Dry cell) and secondary (Lead acid), Lithium battery (Li-MnO_2)- advantages, Fuel cell (H_2-O_2 cell).

UNIT II 15 Periods

Water Chemistry and Corrosion:
Water Chemistry-WHO standards, Municipal water treatment-Removal of suspended impurities-Sedimentation, Co-agulation and Filtration-Disinfection of water by chlorine, Break point chlorination, Dechlorination, Purification by ion-exchange method and reverse osmosis.

Corrosion-Introduction, Electrochemical theory of corrosion, galvanic corrosion, differential aeration corrosion, Factors-temperature, pH, overvoltage. Cathodicprotection by sacrificial anodic method and impressed current method. Electroplating (Cu), Electrolessplating (Ni).

UNIT III 15 Periods

Organic Reactions and Polymers:
Types of organic reactions-Substitution (SN_1 and SN_2), Elimination (E_1 and E_2), Addition-Markownikoff's rule and anti-Markownikoff's rule, Cyclisation (Diel's Alder reaction), Synthesis of aspirin.

Polymers-Functionality, Degree of Polymerization, Tacticity-Addition and condensation polymerization, Relationship between Structure and Properties of polymers (Strength, Crystallinity, Elasticity, Plastic Deformation, Glass transition temperature (T_g)), Factors affecting T_g.

Conducting polymers: Introduction, Examples, General applications, Mechanism of conduction in polyacetylene.

UNIT IV 15 Periods

Spectroscopic techniques and its applications:
Beer-Lambert's law, limitations, colorimetric determination of Fe(III)
UV-VIS spectroscopy – electronic transitions, shifts-blue and red, Block diagram - brief introduction of components, Applications – purity and differentiation of conjugated and non-conjugated dienes.

IR Spectroscopy–condition to be IR active, vibrational modes of–AB_2, Block diagram-brief introduction of components, IR spectrum of CO_2 and H_2O molecules, General applications. Fluorescence and its applications in medicine.

Learning Resources:

Text Books:

1. Engineering chemistry, P.C.Jain and Monica Jain, 16th edition, Dhanpat Rai Publishing Company.
2. Wiley Engineering chemistry, 2nd edition, Wiley India Private Limited.

Reference Books:

1. University Chemistry, Bruce H. Mahan, 3rd edition, Narosa Publishing House.
2. A text book of Engineering chemistry, Shashi Chawla, 3rd edition, Dhanpat Rai Publishing Company.

Web References:

1. Engineering Chemistry (NPTEL Web Book by B.L. Tembe, Kamaluddin&M.S. Krishnan).
2. http://www.powerstream.com/BatteryFAQ.html#lec.
3. http://freevideolectures.com/Course/3029/Modern-Instrumental-Methods-ofAnalysis.

CS/IT/CE/CH/EC /EE/ME 123	Programming for Problem Solving	L	T	P	C
		3	0	0	3

Course Objectives:

1. To know the basic problem solving process using Flow Charts and algorithms.
2. To understand the basic concepts of control structures in C.
3. To learn concepts of arrays, functions, pointers and Dynamic memory allocation in C.
4. To use the concepts of structures, unions, files and command line arguments in C.

Course Outcomes:

1. Develop algorithm and flowchart for simple problems.
2. Use suitable control structures and arrays for developing code in C.
3. Design modular structured programs using functions and recursion.
4. Develop code for complex applications using structures, pointers and file handling features.

Course Content:

UNIT I 12Periods

Introduction to Programming: 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**,** Arithmetic expressions and precedence.

UNIT II 12Periods

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching, Iteration and loops.
Arrays: Arrays (1-D, 2-D), Character arrays and Strings.
Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations.

UNIT III 12Periods

Function: Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference
Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series.

UNIT IV 12Periods

Structure: Structures, Defining structures and Array of Structures
Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures.
File handling: Defining and opening a file, closing a file, input/output operations on files using file handling functions, random access to files.

Learning Resources:

Text Book:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. Programming in C by Stephen G. Kochan, Fourth Edition, Pearson
3. C Complete Reference, Herbert Sheildt, TMH., 2000.
4. Programming with C by K R Venugopal&Sudeep R Prasad, TMH., 1997.

Web References:

1. http://cprogramminglanguage.net/.
2. http://lectures-c.blogspot.com/.
3. http://www.coronadoenterprises.com/tutorials/c/c_intro.htm.
4. http://vfu.bg/en/e-Learning/Computer-Basics--computer_basics2.pdf.

CS/IT/CH/EC 124	English for Communication Skills	L	T	P	C
		2	0	0	2

Course Objectives:

1. To enable students improve their lexical and communicative competence and to equip students with oral and written communication skills. To help students understand and learn the correct usage and application of Grammar principles.
2. To get them acquainted with the features of successful professional communication. To enable students acquire various specific features of effective written communication.

Course Outcomes:

At the end of the course, the student will be able to:
1. Use vocabulary contextually.
2. Compose effectively the various forms of professional communication.
3. Apply grammar rules efficiently in spoken and written forms.

Course Content:

UNIT I 10 Periods

Vocabulary Building
- **1.1 -** Root words from foreign languages and their use in English.
- **1.2 -** Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
- **1.3 -** Synonyms, antonyms, and standard abbreviations**.**
- **1.4 -** One word substitutes.

UNIT II 10 Periods

Writing Skills
- **2.1-** Proposal writing.
- **2.2**- Letter-writing.
- **2.3-** Techniques for writing precisely (précis writing).
- **2.4-** E-mail writing.

UNIT III 10 Periods

Identifying Common Errors in Writing
- **3.1-** Subject-verb agreement.
- **3.2-** Noun-pronoun agreement.
- **3.3-** Articles.
- **3.4-** Prepositions.
- **3.5-** Tenses.
- **3.6-** Redundancies.

UNIT IV 10 Periods

Nature and Style of sensible Writing

4.1- Describing
4.2- Narration
4.3- Classifying
4.4- Coherence and cohesion in paragraph writing

Learning Resources:

Text Book:

1. Communication Skills. Sanjay Kumar and PushpaLata, Oxford University Press.

Reference Books:

1. Remedial English Grammar. F.T. Wood. macmillan.2007
2. On Writing Well. William Zinsser. Harper ResourceBook. 2001
3. Study Writing. Liz Hamp-Lyons and Ben Heasly.Cambridge University Press.2006.
4. Exercises in Spoken English. Parts.I-III. CIEFL, Hyderabad. Oxford University.
5. Practical English Usage. Michael Swan. OUP. 1995Press

CS/IT/CE 161	Chemistry Lab	L	T	P	C
		0	0	3	1.5

Course Objectives:

1. To learn concepts of equivalent weight, molecular weight, normality, molarity, weight and volume percent.
2. To know the methods of determining hardness and chloride ion content of water sample.
3. To learn the redox methods to determine Fe^{2+} ions present in solution.
4. To know principles and methods involved in using instruments like conductivity bridge and potentiometer
5. To know the molecular properties like surface tension, viscosity.
6. To know synthetic methods for preparation of drugs and polymer

Course outcomes:

1. Estimate the Fe(II) content of a given solution and chloride/hardness content of water.
2. Measure molecular properties such as surface tension, viscosity.
3. Measure conductance of solutions, redox potentials of a cell.
4. Synthesize a small drug molecule and polymer.

List of Experiments:

1. Estimation of Mohr's salt using $KMnO_4$.
2. Estimation of Mohr's salt using $K_2Cr_2O_7$.
3. Determination of chloride ion content of water.
4. Determination of Hardness of water using EDTA method.
5. Determination of Fe(II) strength using $K_2Cr_2O_7$potentiometrically.
6. Determination on strength of NaOH using HCI conduct metrically.
7. Determination of surface tension.
8. Determination of Viscosity.
9. Determination of Saponification / acid value of oil.
10. Preparation of p-bromo acetanilide.
11. Preparation of Phenol Formaldehyde resin.
12. Determination of partition co-efficient of I_2 in water.
13. Determination of R_f value using TLC.
14. Verification of Freundlich isotherm using adsorption of acetic acid on activated charcoal.

CS/IT/CE/CH/EC/ EE/ME 162	Programming for Problem Solving Lab	L	T	P	C
		0	0	4	2

Course Objectives:

1. To know the basic problem solving process using Flow Charts and algorithms.
2. To understand the basic concepts of control structures in C.
3. To learn concepts of arrays, functions, pointers and Dynamic memory allocation in C.
4. To use the concepts of structures, unions, files and command line arguments in C.

Course Outcomes:

1. Develop algorithm and flowchart for simple problems.
2. Use suitable control structures and arrays for developing code in C.
3. Design modular structured programs using functions and recursion.
4. Develop code for complex applications using structures, pointers and file handling features.

[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:
Lab 7: Simple functions

Tutorial 8 & 9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures

Tutorial 12: File handling:
Lab 12: File operations

CS/IT/CH/EC 163	Workshop Practice Lab	L	T	P	C
		1	0	4	3

Course Objectives:

Engineers, whatever be their line of activity, must be proficient with all aspects of manufacturing, however it should not be forgotten that practice without theory is blind and the theory without practice is lame.

1. Students involved in acquiring manufacturing skills must have balanced knowledge of theory as well as practice.
2. Imparts basic knowledge of various tools and their use in different sections of manufacture such as fitting, carpentry, tin smithy, moulding, casting, welding, electrical wiring, PCB work on electronic circuits and practice with machine shop tools &equipment's.

Course Outcomes:

1. Students will gain knowledge of the different manufacturing processes which are commonly employed in the industry to fabricate components using different materials.

Course Content:

Manufacturing Methods: (10 Periods)

1. Introduction to various types of manufacturing methods –casting - forming - various machining operations such as turning, milling, shaping, drilling, slotting etc. - various joining methods such as welding, brazing, soldering etc.,- Advanced manufacturing methods (3 Periods)
2. CNC machining and Additive manufacturing (1 Period)
3. Fitting operations and power tools (power hack saw, table mounted circular saw, wood turning lathe, bench grinder, concrete mixer, concrete vibrator etc.,) (1 Period)
4. Basic principles involved in electrical circuits and electronic PCB circuits(1Period)
5. Carpentry (1 Period)
6. Welding(arc welding & gas welding) (1 Period)
7. Metal casting (1 Period)
8. Plastic moulding, glass cutting (1 Period)

Text Books:

1. Hajra Choudhury S, K., Hajra Choudhury A.K and Nirjhar Roy S.K., "Elements of Workshop Technology", VolumeI and Volume II,2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S and Steven S.Schmid.,"Manufacturing Engineering and Technology" 4th edition, Pearson Education, India, 2002.
3. Rao P.N., "Manufacturing Technology", Volume I &II, Tata McGrawHill House, 2017

Work shop Practice: **[60]**

Course Objectives:

Students acquiring practical knowledge on various manufacturing techniques and will be able to fabricate components with their own hands.

Course Outcomes:

Up on completion of laboratory, students will be able to gain the manufacturing skills and get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.

Section wise Experiments:

1. **Machine Shop(10 hours)**

Practice of machining operations on Lathe, Milling, Shapping, Drilling and Slotting Machines.
-Plain, step turning
-Plain, groove and thread cutting

2. **Fitting Shop(8 hours)**

-Inclined fit
-Half round fit

3. **Moulding and Casting(8 hours)**

-Hand wheel
-Stepped cone pulley

4. **Practice on electrical wiring and Electronic circuit boards(8 hours)**

- One bulb controlled by one switch &two bulbs in series controlled by one switch
- Measurement of resistance, voltage and current with the help of a multimeter&soldering an electronic PCB circuit

5. **Welding shop(both arc &gas welding) (8 hours)**

- Square butt joint
- Lap joint

6. **Carpentry(6 hours)**

- Half lap cross joint
- T-Lap joint

7. **Tin Smithy(6 hours)**

- Rectangular tray
- Funnel

8. **Plastic moulding and glass cutting(6 hours)**

- Practice on glass cutting

Text Book:

1. P.Kannaiah, K.L.Narayana., Workshop Manual, Second Edition, Scitech Publications (INDIA) Pvt.Ltd.

CS/IT/CH/EC 164	English Language Communication Skills Lab	L	T	P	C
		0	0	2	1

Course Objectives:

Identify speaker's purpose and tone; make inferences and predictions about spoken discourse, discuss and respond to content of a lecture or listening passage orally and/or in writing. Acquaint the students with the Standard English pronunciation, i.e., Receive Pronunciation (RP), with the knowledge of stress and intonation. Develop production and process of language useful for social and professional life. To develop in them communication and social graces necessary for functioning. Improve the dynamics of professional presentations. To develop critical reading and comprehension skills at different levels.

Course Outcomes:

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

1. Comprehend relationships between ideas and make inferences and predictions about spoken discourse.
2. Speak English with a reasonable degree of accuracy in pronunciation. .
3. Develop appropriate speech dynamics in professional situations.
4. Use effective strategies and social graces to enhance the value of communication.
5. The students are capable of using language effectively to face interviews with success.
6. Develop effective communication and presentation skills.
7. Students will be able to use higher order skills.

Oral Communication

(This unit involves interactive practice sessions in Language Lab)

1- Listening Comprehension
2- Pronunciation, Intonation, Stress and Rhythm
3- Common Everyday Situations: Conversations and Dialogues
4- Interviews
5- Formal Presentations
6- Reading Comprehension

Reference Books:

1. Communication Skills. Sanjay Kumar and PushpaLata. Oxford University Press.
2. Practical English Usage. Michael Swan. OUP. 1995 Press
3. Exercises in Spoken English. Parts.I- III. CIEFL, Hyderabad. Oxford University
4. Technical English .M. Sambaiah, Wiley Publications, New Delhi

MC 002	Environmental Science	L	T	P	C
		2	0	0	0

Course Objectives:

To enable the students to

1. Understand that humans are an integral part of environment and hence their activities reflect on the environment.
2. realize and appreciate the importance of ancient practices and their importance in the present times
3. appreciate the contribution of individuals for the upkeep of environmental standards, in turn help the humans live better.

Course Objectives:

After successful completion of the course, the students are able to

1. evaluate the implications of human activities and thereby promote ecofriendly technologies.
2. promote awareness among the members of the society for a sustainable environment.
3. include and give priority to environmental protection in all developmental projects.

Course Content:

A. AWARENESS ACTIVITIES - SMALL GROUP MEETINGS

I. Source of water for human consumption/activities:

a. collection of information pertaining to water resources and consumption in Andhra Pradesh

b. Water resource on campus: General / Laboratory use and

c. Drinking water - understand the background and adopt judicious management.

d. Recycled water for Gardening - Particularly Lawns.

e. Cut down wastage of electricity in class rooms / labs / hostels etc. by avoiding misuse.

II. After the group meetings and exposure to the local issues and healthy practices, students motivated to make:

a. Posters

b. Slogans/One liners for promoting awareness

III. Lectures from Experts (at least 2 in the course duration)

IV. A walk in the neighborhood to promote a chosen theme on environmental consciousness.

B. ACTUAL ACTIVITIES

1. Plantation on Campus and on the sides of approach road.
2. Distribution of saplings to the local colony dwellers and encourage plantation.

3. Development of Kitchen garden on campus - Cultivation of atleast leafy vegetables and creepers like cucumber etc. for use in college canteen/hostels etc.

4. Adoption of "NO PLASTICS" on campus.

5. Field trip to gain knowledge of biodiversity, water shed, mining, pollution and other local issues.

6. Preparation of working models for energy generation/transformation etc.

C. THEORY SYLLABUS FOR ASSESSMENT

Part-I

1. Introduction to Environmental Studies, Scope and Importance.
2. Natural resources Renewable and Non-Renewable; Definition and importance of the following resources in detail: a. Forest b. Water c. Land d. Energy
3. Sustainable development - Concept and Measures.
4. Biodiversity - Definition, Types of Biodiversity, Values and threats to Biodiversity, Conservation of biodiversity, IUCN classification: Endangered, Threatened, Vulnerable, Rare species; Endemic and Exotic species.
5. Climate change - Global warming, Ozone depletion and Acid rain.

Part-II

6. Water shed, water shed management in detail.
7. Solid wastes and Solid waste management.
8. Environmental Legislation, Environmental acts - Wild life protection act, Water act, Forest conservation act, Air act and Environmental protection act.
9. Case studies: Chernobyl nuclear disaster, Bhopal gas tragedy, Narmada bachao andolan, Silent valley, Story of Tuvalu, Story of Ganga.
10.Earth summit and Kyoto protocol; Measures at individual level for conservation of natural resources and sustainable development.

Learning Resources:

Text Books:

1. Anubha Kaushik and C.P.Kaushik - Environmental Studies, 3rd Edition, New Age International Publishers, New Delhi., 2012.
2. R. Rajagopalan - Environmental studies from crisis to cure, 3rd Edition, Oxford University press, 2012.

ASSESSMENT

1. Two assessments each of 40 marks will be done in the semester. The split up of each assessment is as follows:
a. Two internal theory examinations will be conducted for 18 marks each.
b. Evaluation of the prepared activity sheets and working models will be done for 12M (continual evaluation) twice in the semester in line with the theory examination.
c. 5 Marks for attendance and 5 marks for oral test.

Note: Weightages for a, b & c will be taken as per the assessment guidelines of the R-18 curriculum and projected to 100 marks.

CS V01	English Competency Development Programme	L	T	P	C
		2	0	0	0

Lecture Plan

Session Topic

1. Self Introduction
2. Self Introduction
3. Introducing Others
4. Mind Mapping -Small Talk
5. Random Operation
6. JAM &Extempore
7. Starting a Conversation-Rapid Fire
8. Story Telling
9. Narrating Life Stories
10. Tense Buster
11. Describing people
12. Picture Perception & Description
13. Movie Reviews
14. News Articles-Open Discussion & Debate
15. Everyday Life-Communicative Activities
16. Role Plays
17. Short Versions
18. Contemporary Novels-Critical Appreciation Round

References:

- Contemporary Novels-Critical Appreciation Round.
- eslflow.com/Personality Vocabulary Survey.
- eslflow.com/Celebrity Interview*eslflow.com/Telling stories.
- eslflow.com/ First Impressions/speaking activity.
- Speaking work sheets/Out & About 1 - PHOTOCOPIABLE, Cambridge University Press 2015
- Speaking Unplugged: 30 activities for one-to-one classes by online TEFL training
- Think Teen work book*The guardian weekly/News based English language activities
- Walkietalkiehttps://www.teacherspayteachers.com/Store/Walkietalkie
- AlenMaley's Conversation/Rob Nolasco& Lois Arthur/Oxford University Press
- AlenMaley's Project Work/Diana L.Fried-Booth/Oxford University Press
- Cambridge English/Objective PET/Louise Hashemi& Barbara Thomas
- Cambridge English Business Benchmark/Guy Brook-Hart
- British Council / Learn English Select Face-to-Face Course / APSCHE Communication Skills Project
- Self-Designed Handouts

II/IV B.TECH III-Semester

CS/IT 211	Mathematics – III	L	T	P	C
		3	1	0	4

Course Objectives:

The objectives of this course is to familiarize the students with statistical techniques. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

Course Outcomes:

The students will learn

1. The ideas of random variables and various discrete and continuous random variables and their properties.
2. The application of various probability distribution concepts to solve the engineering problems.
3. The basic ideas of statistics including correlation, regression, least squares fit to various curves.
4. The statistical methods for analyzing experimental data by testing the hypotheses.

Course Content:

UNIT I 10 Periods

Basic Probability:
Discrete random variables and their properties, Expectation of Discrete Random Variables, Continuous random variables and their properties, Expectation of Continuous Random Variables, Distribution functions and densities, Moments, Chebyshev's Inequality.

UNIT II 16 Periods

Discrete and Continuous Probability Distributions:
Binomial distribution, infinite sequences of Bernoulli trials, Poisson approximation to the Binomial distribution- Evaluation of statistical parameters for these distributions.
Normal, Exponential and Gamma densities-. Evaluation of statistical parameters for these distributions.

UNIT III 14 Periods

Correlation and regression – Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.

UNIT IV 14 Periods

Test for single mean, difference of means, test for ratio of variances, Chi-square test for goodness of fit for Binomial and Poisson Distributions, and independence of attributes.

Tests of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Learning Resources:

Text Book:

1. Miller &Freund's Probability and Statistics for Engineers – Richard A. Johnson

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
8. S.C.Gupta and V.K.Kapoor.,Fundamentals of Mathematical Statistics, Sultan Chand &Co.

CS/IT 212	Life Science for Engineers	L	T	P	C
		2	0	0	2

Course Objectives:

1. Recall the basics of biology viz. cellular organization, function and classification.
2. Provide an understanding of the basic structure and functions of major biomolecules.
3. Describe the transfer of genetic information andIntroduce the techniques used for modification of living organisms.
4. Describe the applications of rDNA technology and biomaterials.

Course Outcomes:

1. Understand and appreciate the cellular organization and its diversity.
2. Recognize and understand the molecular basis of different forms of life and their applications.
3. Identify the complementarity in the structure and functions of biomolecules.
4. Differentiate the genetic phenomena and demonstrate the genetic engineering of organisms.

Course Content:

UNIT I: Living Organisms (CO1) 6Periods

Comparison of biological organisms with manmade systems, Classification of living organisms, Cellular basis of life.

Differences between prokaryotes and eukaryotes, classification on the basis of carbon and energy sources, molecular taxonomy.

UNIT II: Proteins and Enzymes (CO2) 6Periods

Water, Biomolecules – carbohydrates, proteins and lipids, structure and functions of proteins and nucleic acids, hemoglobin, antibodies.

Enzymes: Basic Structure and Classification of Enzymes; Enzymes in Fermentation and industrial applications

UNITIII: Cell Physiology (CO3) 6Periods

Bioenergetics, Respiration: Glycolysis and TCA cycle, Electron transport chain and oxidative phosphorylation.

Mechanism of photosynthesis; Neurons, synaptic and neuromuscular junctions

UNIT IV: Genes and genetic material (DNA andRNA) (CO4) 10Periods

Mendel's laws, gene mapping, Mitosis and Meiosis, single gene disorders in humans, Genetic code, DNA replication, Transcription, Translation

Recombinant DNA Technology: recombinant vaccines, transgenic microbes, animal cloning, biosensors, biochips.

Learning Resources:

Text Books:

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018.
2. Arthur T Johnson, Biology for Engineers, CRC press, 2011

Reference Books:

1. Alberts et al. The molecular biology of the cell, 6th edition, Garland Science, 2014.
2. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.
3. John Enderle and Joseph Bronzino Introduction to Biomedical Engineering, 3rd edition, 2012.

CS/IT 213	Digital Electronics	L	T	P	C
		3	0	0	3

Course Objectives:

At the end of the course, the student will understand

1. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
2. To prepare students to perform the analysis and design of various digital electronic circuits.

Course Outcomes:

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

1. Illustrate number system and demonstrate various digital circuits in digital electronics.
2. Analyze and design various combinational circuits.
3. Analyze and design various sequential circuits.
4. Compare and build various semiconductor memories.

Course Content:

UNIT I 14 Periods

Fundamentals of Digital systems: Introduction, Digital Signals, Basic Digital circuits, NAND and NOR Operations, Exclusive-OR and Exclusive-NOR Operations, Boolean Algebra, codes: BCD, excess – 3, Gray.

Number Systems and Codes: Number systems, Binary Number system, Signed Binary Numbers Binary Arithmetic, 2's Complement Arithmetic, Octal Number system, Hexadecimal Number System.

UNIT II 12 Periods

Combinational digital Circuits: Standard Representations for Logic Functions, Karnaugh Map Representation of Logic Functions, Simplification of Logic Functions using K-Map, Minimization of Logic Functions Specified in Minterms / Maxterms or Truth Table, Minimization of Logic Functions Not Specified in Minterms / Maxterms, Don't –Care conditions, Design Examples, EX-OR and EX-NOR Simplification of K-Maps, Five and Six-Variable K-Maps, Quine-Mc Cluskey Minimization Technique.

Combinational Logic Design Using MSI Circuits: Multiplexers and their use in Combinational Logic Design, DE multiplexer / Decoders and their use in Combinational Logic Design, Adders and their use as Sub tractors, BCD Arithmetic, Arithmetic Logic Unit(ALU), Digital Comparators, Code Converters.

UNIT III 12 Periods

Sequential Circuits and Systems: A 1-Bit Memory Cell, Clocked S-R FLIP-FLOP, J-K FLIP FLOP, D-TYPE FLIP-FLOP, T-TYPE FLIP-FLOP, Excitation Table of FLIP-FLOP, Clocked FLIP-FLOP Design, Edge-Triggered FLIP-FLOPs.

Sequential Logic Design: Registers, Applications of Shift Registers, Ripple or Asynchronous counters, Synchronous Counters,

UNIT IV 12 Periods

Programmable Logic Devices: Introduction, ROM as a PLD, Programmable Logic Array: Input Buffer, AND matrix, OR matrix, Invert / Non-invert matrix, Programmable Array Logic
A/D and D/A Converters: Introduction, Digital to Analog Converters: Weighted – Resistor D/A converter, R-2R Ladder D/A convertor, Analog to digital Converter: Quantization and Encoding, Parallel – Comparator A/D Converter, Successive Approximation A/D converters.

Learning Resources:

Text Book:

1. R.P.Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

Reference Books:

1. M.M.Mano, "Digital Logic and computer Design", Pearson Education India, 2016.
2. A.Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

CS/IT 214	Discrete Mathematics	L	T	P	C
		3	0	0	3

Course Objectives:

At the end of the course, the student will understand

1. Problem solving strategies and methods of proof.
2. Model and analyse computational processes using combinatorial methods.
3. Problem solving using recurrence relations.
4. Binary and n-ary relations and their applications.
5. The basic concepts of graphs.

Course Outcomes:

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

1. Apply Propositional logic and first order logic to solve problems.
2. Apply basic counting techniques to solve combinatorial problems.
3. Formulate and solve recurrence relations.
4. Formulate and solve graph problems.

Course Content:

UNIT I 12 Periods

The Foundations: Logic and Proofs, Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy

Basic Structures: Sets, Set Operations, Functions, Sequences and Summations, Cardinality of Sets.

UNIT II 13 Periods

Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms.

Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Generalized Permutations and Combinations, Generating Permutations and Combinations.

UNIT III 12 Periods

Advanced Counting Techniques: Applications of Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion–Exclusion, Applications of Inclusion–Exclusion.

Relations: Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations.

UNIT IV 13 Periods

Relations: Equivalence Relations, Partial Orderings.

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Planar Graphs, Graph Coloring.

Learning Resources:

Text Book:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, Tata McGraw – Hill.

Reference Books:

1. Discrete Mathematics for Computer Scientists, Abraham Kandel, Joe L. Mott, and Theodore P. Baker
2. Susanna S.Epp, Discrete Mathematics with Applications, 4th edition, Wadsworth Publishing Co. Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.
4. J.P. Tremblay and R.Manohar, Discrete Mathematical Structure and It's Application to Computer Science", TMG Edition, Tata Mcgraw-Hill.
5. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press.
6. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson, Discrete Mathematics, Tata McGraw – Hill.

CS/IT 215	Data Structures	L	T	P	C
		3	0	0	3

Course Objectives:

At the end of the course, the student will understand

1. To teach efficient storage mechanisms of data for an easy access.
2. To design and implementation of various basic and advanced data structures.
3. To introduce various techniques for representation of the data in the real world.
4. To develop application using data structures.
5. To teach the concept of protection and management of data.
6. To improve the logical ability.

Course Outcomes:

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

1. Select appropriate data structures as applied to specified problem definition.
2. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.
3. Implement Linear and Non-Linear data structures, and design advance data structures for the real world problems.
4. Implement appropriate sorting/searching technique for given problem.

Course Content:

UNIT I 14 Periods

Introduction: Analysis of an Algorithm, Asymptotic Notations, Time and Space trade-off.

Searching: Linear search and binary search techniques and their Complexity analysis.

Singly Linked lists: Representation in Memory, Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation —singly linked lists.

UNITII 14 Periods

Circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

Stacks: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of stacks: Expression conversion and evaluation- corresponding algorithms and complexity and analysis.

UNIT III 16 Periods

Queues: ADT Queue, types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithm and their analysis.

Trees: Basic Tree Terminologies, Different types of trees: Binary Tree, Binary Search Tree, AVL Tree, Tree operations on each of the trees and their algorithms. Applications of Binary Trees, B-Tree definitions and algorithms.

UNIT IV 14 Periods

Sorting Algorithms: Bubble sort – Selection sort – Insertion sort – Shell sort – Radix sort. , Heap – Applications of heap. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Learning Resources:

Text Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education,1997.

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson ducation,1983.
3. Stephen G. Kochan, "Programming in C", 3rd edition, Pearson Education.
4. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008.
5. ReemaThareja, "Data Structures Using C", Second Edition, Oxford University Press, 2011.

CS/IT 216	Object Oriented Programming	L	T	P	C
		3	0	0	3

Course Objectives:

At the end of the course, the student will understand

1. Understand the basic concepts of Java to design and develop secure Java applications.
2. Apply the concepts of exception handling, multi-threading, streams and applet programming.
3. Design browser supported GUI components.
4. Design AWT, Swing components, and event handling mechanism applications.

Course Outcomes:

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

1. Develop simple Java applications.
2. Design and implement APIs and Multitasking applications.
3. Design and implement, File management, and web based applications.
4. Develop GUI applications using AWT and Swing components.

Couse Content:

UNIT I 12Periods

Introduction: Introduction to java, features of object-oriented programming, data types, dynamic initialization, scope and life time, operators, control statements, arrays, type conversion and casting, finals & blank finals.

Classes and Objects: Concepts, methods, constructors, usage of static, access control, this key word, garbage collection, finalize()method, overloading, parameter passing mechanisms, nested classes and inner classes.

Inheritance: Basic concepts, access specifiers, usage of super key word, method overriding, final methods and classes, abstract classes, dynamic method dispatch, Object class.

Interfaces: Differences between classes and interfaces, defining an interface, implementing interface, variables in interface and extending interfaces.

UNIT II 13 Periods

Packages: Creating a Package, setting CLASSPATH, Access control protection, importing packages.

Strings: Exploring the String class, String buffer class, Command-line arguments.

Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes.

Multithreading: Concepts of Multithreading, differences between process and thread, thread life cycle, Thread class, Runnable interface, creating multiple threads, Synchronization.

UNIT III 12 Periods

I/O Streams: Streams, Byte streams, Character streams, File class, File streams.

Generic Types: Generic Method, Generic Class

Collections: List, Queue, Set

Applets: Concepts of Applets, life cycle of an applet, creating applets, passing parameters to applets, accessing remote applet, Color class and Graphics.

UNIT IV 13 Periods

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling events.

AWT: AWT Components, windows, canvas, panel, File Dialog boxes, Layout Managers, Event handling model of AWT, Adapter classes, Menu, Menu bar.

GUI with Swing– swings introduction, JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons. Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

Learning Resources:

Text Book:

1. Herbert Schildt, The Complete Reference Java J2SE 9th Edition, TMH Publishing Company Ltd, NewDelhi.

Reference Books:

1. Herbert Schieldt, The Complete Reference - C++ - 4/e, Tata McGraw Hill.
2. Cay.S.Horstmann and Gary Cornell, Core Java 2, Vol 1, Fundamentals 7th Edition, Pearson Education.
3.H.M.Dietel and P.J.Dietel, Java How to Program, Sixth Edition, Pearson Education/PHI.
4. Barbara Liskov, *Program Development in Java*, Addison-Wesley, 2001.
5. Cay Horstmann, John Wiley and Sons ,Big Java 2nd Edition, ,Pearson Education.

CS/IT 251	Digital Electronics Lab	L	T	P	C
		0	0	2	1

Course Objectives:

At the end of the course, the student will understand

1. To analyse logic processes and implement logical operations using combinational logic circuits.
2. To understand concepts of sequential circuits and to analyse sequential systems in terms of state machines.
3. To understand characteristics of memory and their classification.

Course Outcomes:

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

1. Develop a digital logic and apply it to solve real life problems.
2. Design and implement combinational logic circuits.
3. Design and implement sequential logic circuits.
4. Classify different semiconductor memories.

List of Experiments:

1. Verification of logic gates using discrete components.
2. Realization of Gates using Universal Building Blocks (NAND only).
3. Design of Combinational Logic Circuits like Half-adder, Full-adder, Half-Sub tractor.
4. Verification of 4-bit Magnitude Comparator.
5. Design of Decoders (BCD - Decimal decoder).
6. Design of Code Converters (Binary to Gray & Gray to binary).
7. Design of Multiplexers/De Multiplexers.
8. Verification of Flip-Flops.
9. Design of Shift register (To Verify Serial to parallel, Serial to Serial and parallel to parallel Converters) using Flip-Flops.
10. Design of Ring & Johnson Counters using Flip-Flops.
11. Conversion of Flip-Flops (JK-T, JK - D).
12. Design of Binary/Decade Counter.
13. Design of Asynchronous Counter, Up Counter, Down Counter.
14. Design of Synchronous Counter, Mod Counter, Up Counter, Down Counter & Up/Down Counter.

Note: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

CS 252	Data Structures Lab	L	T	P	C
		0	0	4	2

Course Objectives:
The course is designed to
1. develop and analyze simple linear and nonlinear data structures.
2. identify and apply the suitable data structure for the given real-world problem

Course Outcomes:
At the end of the course, the student will be able to
1. Implement various ADTs
2. Identify appropriate data structure for a given application
3. Develop application using suitable ADTs

List of Experiments:

1. Solving Problems Using Arrays.
2. Implementation of Linked Lists: Singly linked, Doubly linked and Circular lists.
3. Applications of Linked List.
4. Implementation of Stack.
5. Applications of Stack.
6. Implementation of Queue.
7. Operations on Binary Search Trees.
8. Problems related Balanced Trees.
9. Hashing and Collision Resolution.
10. Problems related to sorting and searching algorithms.
11. Problems related B-Trees.

- Not limited to these programs only, if necessary the teacher can include some more applications based on his/her perception.

CS 253	Object Oriented Programming Lab	L	T	P	C
		0	0	2	1

Course Objectives:

At the end of the course, the student will understand

1. Understand the basic concepts of Java to design and develop secure Java applications.
2. Apply the concepts of exception handling, multi-threading, streams and applet programming.
3. Design browser supported GUI components.
4. Design AWT, Swing components, and event handling mechanism applications.

Course Outcomes:

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

1. Develop secure Java applications.
2. Create simple Java user interfaces.
3. Develop File management, and web based applications.
4. Construct event driven GUI applications using AWT and Swing components.

List of Programs:

1. Demonstrate Static Member, Static Method and Static Block.
2. Demonstrate Method Overloading and Method Overriding.
3. Demonstrate Finals, Blank Finals, Final Methods, And Final Classes.
4. Demonstrate Synchronous Keyword.
5. Implement Multiple Inheritance.
6. Demonstrate Packages.
7. Create User Defined Exception Class and Test This Class.
8. Write an Applet Program to Demonstrate Graphics Class.
9. Write GUI Application Which Uses AWT Components Like Label, Button, Text Filed, Text Area, Choice, Checkbox, Checkbox Group.
10. Write a program to Demonstrate Mouselistener, Mousemotionlistener, Keyboardlistener, Actionlistener, Itemlistener.
11. Develop Swing Application Which Uses Jtree, Jtable, Jcombobox.

MC 001	Constitution of India	L	T	P	C
		2	0	0	0

Course Objective:
To provide basic information about Indian Constitution.

Course Outcomes:
On successful completion of the course the students will be able to:

1. Understand the significance of many provisions of the Constitution as well as to gain insight into their back ground. They will also understand number of fundamental rights subject to limitations in the light of leading cases.
2. Study guidelines for the State as well as for the Citizens to be followed by the State in the matter of administration as well as in making the laws. It also includes fundamental duties of the Indian Citizens in Part IV A (Article 51A).
3. Understand administration of a State, the doctrine of Separation of Powers.
4. Know how the State is administered at the State level and also the powers and functions of High Court.
5. Understand special provisions relating to Women empowerment and also children. For the stability and security of the Nation, Emergency Provision are Justified.
6. Understand election commission as an independent body with enormous powers and functions to be followed both at the Union and State level. Amendments are necessary, only major few amendments have been included.

Course Content:

UNIT I 10 Periods

Preamble to the Constitution of India Domicile and Citizenship. Fundamental rights under Part III,Leading Cases. Relevance of Directive Principles of State Policy under Part-IV, IV-A Fundamental duties.

UNIT II 10 Periods

Union Executive - President, Vice-President, Prime Minister, Union Legislature - Parliament and Union Judiciary - Supreme Court of India. State Executive - Governors, Chief Minister, State Legislature and High Court.

UNIT III 10 Periods

Special Constitutional Provisions for Scheduled Casters and Tribes, Women and Children and Backward Classes, Emergency Provisions.

UNIT IV 10 Periods

Electoral process, Centre State Relations (Amendment Procedure, 42nd, 44th, 74th, 76th, 86th and 91st Constitutional amendments).

Learning Resources:

Text Book:

1. Durga Das Basu, Introduction to the Constitution of India" (student edition) Prentice - Hall EEE,19th/20th Edition, 2001.

Reference Books:

1. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.

2. Brij Kishore Sharma, "Introduction to the Constitution of India", PHI, Learning Pvt.Ltd., New Delhi,2011.

MC 004	Design Thinking and Product Innovation	L	T	P	C
		2	0	0	0

Course Objectives:

1. Identify the design thinking processes and methods.
2. Plan research activities to gather and empathize from a user's viewpoint.
3. Ideate techniques to help arrive at the best solution and evaluation.
4. Identify design thinking approaches for business challenges.

Course Outcomes:

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

1. Interpret the concepts of Design thinking.
2. Investigate a problem to determine its root cause.
3. Take part in group thinking and experiment with different solutions.
4. Develop innovative thinking and creative problem solving.

Course Content:

UNIT I Text Book 1,2 8 Periods

Introduction to Design Thinking – Origin of Design Thinking, Features & Principles of Design Thinking, Applications of Design Thinking, Role of Research in Design Thinking.

UNIT II Text Book 3 8 Periods

Modules of Design Thinking – Inspiration – methods & tools used in Explore and Empathize phases of Design Thinking, Case study-activity.

UNIT III Text Book 3 8 Periods

Modules of Design Thinking– Ideation & Implementation – methods &tools used in Experiment, Engage and Evolve phases of Design Thinking, Case study-activity.

UNIT IV Text Book 4 8 Periods

Design Thinking applied in Business & Strategic Innovation – Ten Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition,Standardization, Creative Culture, Strategy & Organization – Design Thinking approaches.

Learning Resources:

Text Books:

1. "Design Thinking for Entrepreneurs and Small Businesses" by Beverly Rudkin Ingle, Apress.
2. "Change by design", Tim Brown, Harper Collins, 2009.
3. "Design Thinking- The Guide Book" – Facilitated by the Royal Civil service Commission, Bhutan.
4. Idris Mootee, "Design Thinking for Strategic Innovation", John Wiley & Sons (2013).

Reference Books:

1. "Design Thinking Business Innovation", Rio de Janeiro – 2012 1st edition, MJV press.
2. "Design Thinking- Understanding How Designers Think and Work" by Nigel Cross, Berg publishers.

Web References:

1. IDEO: Design Thinking for Educators toolkit https://designthinkingforeducators.com/.
2. https://dschool.stanford.edu/resources/a-virtual-crash-course-in-design-thinking
3. https://dschool-old.stanford.edu/groups/designresources/wiki/4dbb2/ (wallet Project)

CS/IT 221	Computer Organization	L	T	P	C
		3	0	0	3

Course Oobjectives:

At the end of the course the students will understand

1. Working of computer system and the principles of instruction level architecture and instruction execution
2. Concepts of I/O devices, hardware components in CPU, and its working principles.
3. The state of art in memory system design
4. Concepts of computer arithmetic and advanced pipelining techniques.

Course Outcomes:

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

1. Define the structure of computer and construct control sequence for an instruction.
2. Demonstrate various I/O handling mechanisms and design control unit organization.
3. Illustrate I/O Organization and memory hierarchy.
4. Implement algorithms related to computer arithmetic, and develop a pipeline for consistent execution of instructions.

Course Content:

UNIT I 12 Periods

Basic structure of computers: Computer types, Functional Units, Basic Operational Concepts, Number Representation and Arithmetic, Character Representation, Performance.

Instruction Set Architecture: Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Stacks, Subroutines, Additional Instructions, Encoding of Machine Instructions.

UNIT II 13 Periods

Basic Input/ Output: Accessing I/O Devices: I/O Device Interface, Program-Controlled I/O; Interrupts: Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling I/O Device Behavior, Processor Control Registers.

Basic Processing Unit: Some Fundamental Concepts, Instruction Execution, Hardware Components, Instruction Fetch and Execution Steps, Control Signals, Hardwired Control.

UNIT III 12 Periods

Input/output Organization: Bus Structure, Bus Operation: Synchronous Bus, Asynchronous Bus; Arbitration, Interface Circuits; PCI Bus, SCSI Bus.

The Memory System: Basic Concepts, Semiconductor RAM Memories, Read-only Memories, Direct Memory Access, Memory Hierarchy, Cache Memories, Performance Considerations, Virtual Memory, Secondary Storage.

UNIT IV 13 Periods

Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Unsigned Numbers, Multiplication of Signed Numbers, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.

Pipelining: Basic Concept-The Ideal Case, Pipeline Organization, Pipelining Issues, Data Dependencies, Memory Delays, Branch Delays, Resource Limitations, Performance Evaluation.

Learning Resources:

Text Book:

1. Computer Organization and Embedded Systems, 6th Edition by CarlHamacher, McGraw Hill Higher Education.

Reference Books:

1. Computer Organization and Design: The Hardware/Software Interface, 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. Computer Architecture and Organization, 3rd Edition by John P. Hayes, WCB/McGraw-Hill.
3. Computer Organization and Architecture: Designing for Performance, 10th Edition by William Stallings, Pearson Education.
4. Computer System Design and Architecture, 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

CS/IT 222	Operating Systems	L	T	P	C
		3	0	0	3

Course Objectives:

At the end of the course, the student will understand

1. Operating system structure, functions and IPC mechanism.
2. Concepts of multithreading, process scheduling and process synchronization.
3. Dead lock handling mechanisms and memory management techniques.
4. Concepts of file management and secondary storage management.

Course Outcomes:

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

1. Compare different types of operating systems and describe operating system structure and its functions.
2. Design algorithms on CPU scheduling and classical problems of process synchronization.
3. Describe and Analyze dead lock handling mechanisms, memory management techniques and page replacement polices.
4. Identify and compare different file allocation, disk free space management methods and disk scheduling mechanisms.

Course Content:

UNIT I 12 Periods

Introduction: What Operating Systems Do, Operating-System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Kernel Data Structures.
System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, Operating-System Structure.
Process Concept: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication.

UNIT II 14 Periods

Multithreaded Programming: Overview of Multithreading, Multicore Programming, Multithreading Models, Implicit Threading, Threading Issues.
Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling.
Synchronization: Background, The Critical-Section Problem, Peterson 'solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors.

UNIT III 14 Periods

Dead Locks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock
Memory-Management Strategies: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.
Virtual-Memory Management: Background, Demand Paging, Page Replacement, allocation of frames, Thrashing.

UNIT IV 10 Periods

Files System: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File sharing, Protection.
Implementing File-Systems: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, and Free-Space Management.
Mass-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling.

Learning Resources:

Text Book:

1. Operating System Concepts-Abraham Silberchatz, Peter B, Galvin, Greg Gange 9th Edition, John Wiley.

Reference Books:

1. Operating Systems, Internal and Design Principles, Stallings, 8th Edition-2015, Pearson education/PHI.
2. Operating system A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tenenbaum 4th Edition Pearson/PHI.
4. An Introduction to Operating Systems, Concepts and Practice, 4th Edition, PHI, 2013-Pramod Chandra P. Bhatt.
5. Operating Systems- A concept based approach –DM Dhamdhere -3rd Edition TMH.

Web References:

1. http://www.cs.kent.edu/~farrell/osf03/oldnotes/index.html: Lecture Notes
2. http://www.computerhope.com/os.htm: Different Types of Operating Systems
3. http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-BANG/
4. Operating%20Systems/New_index1.html: Question Bank and Test Problems
5. http://www.personal.kent.edu/~rmuhamma/OpSystems/os.html: OS Lecture Notes

CS/IT 223	Database Management Systems	L	T	P	C
		3	0	0	3

Course Objectives:

At the end of the course the students will understand

1. The fundamental concepts of database system design.
2. Advanced formal relational Languages and SQL to query, update, and manage a database.
3. Relational database design and Implementation.
4. various modules in Database system.
5. Design principles involved with modeling, designing, and implementing a DBMS.

Course Outcomes:

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

1. Illustrate the fundamental concepts of database and choose suitable database architectures for implementation.
2. Implement formal relational operations in relational algebra and SQL.
3. Design database relations using normalization process for relational databases and develop the Query processing and optimization techniques.
4. Develop the mechanism for multi-user database applications.

Course Content:

UNIT I 12 Periods

Introduction to Databases: Introduction - An Example - Characteristics of the Database Approach - Actors on the Scene - Workers behind the Scene - Advantages of Using the DBMS Approach - A Brief History of Database Applications.

Overview of Database Languages and Architecture: Data Models, Schemas, and Instances - Three-Schema Architecture and Data Independence - Database Languages and Interfaces - The Database System Environment - Centralized and Client/Server Architectures for DBMSs - Classification of Database Management Systems.

Conceptual Data Modeling Using Entities and Relationships: Using High-Level Conceptual Data Models for Database Design – A Sample Database Application - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types - Refining the ER Design for the COMPANY Database - ER Diagrams, Naming Conventions, and Design Issues.

UNIT II 12 Periods

The Basic Relational Model : Relational Model Concepts - Relational Model Constraints and Relational Database Schemas - Update Operations, Transactions, and Dealing with Constraint Violations - Relational Database Design Using ER-to-Relational Mapping.

Formal Relational Languages: Unary Relational Algebra Operations-Relational Algebra Operations from Set Theory - Binary Relational Operations: JOIN and DIVISION - Additional Relational Operations - The Tuple Relational Calculus - The Domain Relational Calculus.

SQL: SQL Data Definition and Data Types - Specifying Constraints in SQL – Basic Retrieval Queries in SQL- INSERT, DELETE, and UPDATE Statements in SQL-More Complex SQL Retrieval Queries-Views (Virtual Tables) in SQL-Schema Change Statements in SQL.

UNIT III 14 Periods

Introduction to Query Processing and Query Optimization Techniques: Translating SQL queries into Relational Algebra - Algorithms for External Sorting-Algorithms for SELECT and JOIN Operations-Algorithms for PROJECT and SET operations-Implementing Aggregate Operations and Outer Joins - Combining Operations using pipelining-Using Heuristics in query Optimization.

Database Design Theory: Informal Design Guidelines for Relation Schemas - Functional Dependencies - Normal Forms Based on Primary Keys: 1NF, 2NF, 3NF - Boyce-Codd Normal Form-Multi valued Dependency and Fourth Normal Form- Join Dependencies and Fifth Normal Form.

Normalization Algorithms: Inference rules, Equivalence, Closure set and minimal cover in Functional Dependencies-Properties of Relational Decompositions - Algorithms for Relational Database Schema Design – About Nulls, Dangling Tuples and Alternative Relational Designs.

UNIT IV 12 Periods

Foundations of Database Transaction Processing: Introduction to Transaction Processing - Transaction and System Concepts - Desirable Properties of Transactions - Characterizing Schedules Based on Recoverability - Characterizing Schedules Based on Serializability.

Introduction to Protocols for Concurrency Control in Databases: Two-Phase Locking Techniques for Concurrency Control - Concurrency Control Based on Timestamp Ordering – Multi version Concurrency Control Techniques - Validation (Optimistic) Concurrency Control Techniques.

Introduction to Database Recovery Protocols: Recovery Concepts - Recovery Techniques Based on Deferred Update - Recovery Techniques Based on Immediate Update - Shadow Paging.

Introduction to Database Security: Introduction to Database Security issues-Discretionary Access Control Based on Granting and Revoking Privileges - Mandatory Access Control and Role based Access Control for Multi Level Security-SQL injection-Introduction to Statistical Database Security.

Learning Resources:

Text Book:

1. Database Systems, RamezElmasri and ShamkantB.Navathe, Pearson Education, 6th edition.

Reference Books:

1. Introduction to Database Systems, C.J.Date, Pearson Education, Fifth edition.
2. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition.
3. Data base System Concepts, Abraham Silberschatz, Henry F. Korth, S.Sudarsan, McGraw hill, 6th edition.

CS/IT 224	Formal Languages & Automata Theory	L	T	P	C
		3	0	0	3

Course Objectives:

At the end of the course, the student will understand

1. Describe and formulate Finite Automata.
2. The concepts of regular languages and their properties.
3. Context Free Languages and their properties.
4. Context Sensitive languages, design the Turing Machines and classify the decidable and undecidable problems.

Course Outcomes:

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

1. Model, Compare and Annalise Finite Automata.
2. Apply mathematical methods to prove Regular Languages, grammars, and Automata.
3. Articulate Context Free Languages and Synthesize PDAs.
4. Design Turing Machines and analyze Decidable and Undecidable problems.

Course Content:

UNIT I 12 Periods

Automata: Introduction to Automata, The central concepts of automata theory - Alphabets, Strings, Languages.

Finite Automata: An Informal picture of finite automata, Deterministic finite automata (DFA) - Definition of DFA, DFA processing strings, Notations for DFA, Extended transition function, the language of DFA, Non deterministic finite automata (NFA) – Definition of NFA, Extended transition function, the language of NFA, Equivalence of DFA and NFA Finite

Automata with $\in$ transitions: Use of $\in$ - transition, notation for an $\in$ - NFA, Epsilon closures, extended transitions and languages, Applications.

UNIT II 12 Periods

Regular Expressions and Languages: Regular expressions, finite automata and regular expressions, Algebraic laws of regular expressions.

Properties of Regular Languages: Proving languages are not regular – Pumping lemma for regular languages, Applications of the pumping lemma, Closure Properties of Regular Languages, Equivalence and minimization of automata – Minimization of DFA

UNIT III 14 Periods

(Construction based treatment & proofs are excluded)

Context Free Grammars: Context Free Grammars, Parse Trees, Constructing parse trees, derivations and parse trees, ambiguous grammars.

Pushdown Automata: Definition of the Pushdown automata, the languages of PDA, Equivalences of PDA's and CFG's.

Context free languages: Normal form's for context- Free grammars, the pumping lemma for context free languages.

Properties of Context free languages: closure properties for context free languages, Decision properties for CFL's.

UNIT IV 12 Periods

Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.
Introduction to Turing Machines: The Turing Machine, programming techniques for Turing machines.
Undecidability: A language that is not recursively enumerable, an undecidable problem that is RE, Undecidability problems about TM, Post's Correspondence problem.

Learning Resources:

TextBook:

1. John.E.Hopcroft, R.Motwani&Jeffery.D Ullman, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2003

Reference Books:

1. Daniel I.A.Cohen, 'Computer Theory', Wiley Publications
2. KLP Mishra &N.Chandrasekharan, 'Theory of Computation', PHI.
3. MichealSipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.
4. R. K. Ragade, "Automata and Theoretical Computer Science", First Edition, Pearson Education, 2004.
5. John E Hopcroft & Jeffery D Ullman' 'Introduction to Automata Theory & Languages and Computation', Narosa Publishing House.
6. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.
7. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
8. John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill.

CS/IT 225	Introduction To Industrial Management (Humanities Elective-I)	L	T	P	C
		3	0	0	3

Course Objectives:

1. To provide the students a foundation in concepts and skills in management.
2. To make the students understand the concept of interest and evaluation of project alternatives.
3. Prepare the students for facing the changing environment, its implication on human resources and to achieve the corporate excellence.
4. Provide awareness about the materials requirement and procurement, in order to produce good quality products and maintain quality as desired by the consumer.

Course Outcomes:

1. The course helps the students to become aware of the inference of organization structure and performance of people working in organizations.
2. The course helps students to get knowledge about time value of money, evaluation of alternatives in the changing economic environment.
3. The course helps the students to understand the elements of human resource management to acquire competitive advantage.
4. The course helps the students to use right sort of material for delivering the right products and services to the market.

UNIT I [Text Book-1] 15 Periods

GENERAL MANAGEMENT: Management Concept, Managerial levels, Managerial Skills, Managerial levels v/s skills, Brief treatment of managerial functions, Scientific Management Principles, Administrative Principles of Management.

FORMS OF BUSINESS ORGANISATION: Salient features of sole proprietorship. Partnership, Joint Stock Company, Private limited and Public limited companies.

UNIT II [Text Book-1] 15 Periods

FINANCIAL MANAGEMENT:

Objectives of Financial Management – Concept of money - Simple interest – Compound interest Equivalent cash flow diagram.

ECONOMIC EVALUATION OF ALTERNATIVES: Basic methods – the annual equivalent method – Present worth method – future worth method.

DEPRECIATION: Purpose – Definition – types of depreciation – common methods of depreciation – The Straight Line Method – Diminishing Balance Method - the sum of the Years Digits Method.

UNIT III [Text Book-1] 15 Periods

HUMAN RESOURCE MANAGEMENT:

Functions of Human Resource Management – Job Analysis – Human Resources Planning – Brief treatment of Recruitment - Selection – Placement - induction & Orientation – Training and Development - Performance Appraisal.

UNIT IV [Text Book-1] 15 Periods

MATERIAL MANAGEMENT:

Functions of Materials Management - Material Requirement Planning – Purchasing – Objectives of Purchasing – Sources of Selection – Procurement Methods – Vendor Rating - Inventory Management – EOQ – EPG – ABC Analysis.

MARKETING MANAGEMENT: Functions of Marketing – Marketing Mix – Product life cycle – channels of distribution – Marketing Segmentation – Advertising & Sales promotion – Market Research.

Learning Resources:

Text Books:

1. KK Ahuja, Industrial Management and Organizational Behaviour, Khanna Publishers.
2. Pravin Kumar, Industrial Engineering and Management , Person Publications.
3. N.V.S.Raju, Industrial Engineering and Management, Cengage Learning.

Reference Books:

1. Philip Kotler, Marketing Management , 11th Edition, Pearson Education.
2. Gary Dessler, Human Resource Management, Pearson Education 11th Edition.
3. Heinz Weirich and Harold Koontz, Management, 10th Edition, TMH.

Web References:

1. www.managementstudyguide.com: Describes the Concepts of Management & Its Operational Functions.
2. www.1000 ventures.com:Describes about Management Gurus, Business Gurus.
3. www.citehr.com: Describes the Human Resource Management Topics.

CS/IT 226 **Open Elective-I** **L T P C**

3 0 0 3

OPEN ELECTIVE COURSES

CODE NO.	SUBJECT NAME	CODE NO.	SUBJECT NAME
CEOL01	BUILDING MATERIALS AND CONSTRUCTION	CEOL02	SOLID WASTE MANAGEMENT
CEOL03	REMOTE SENSING AND GIS	CHOL01	ENERGY ENGINEERING
CHOL02	BIOFUELS	CHOL03	POLLUTION CONTROL
CHOL04	NANOSCIENCE AND NANOTECHNOLOGY	ECOL01	APPLIED ELECTRONICS
ECOL02	BASIC COMMUNICATION	ECOL03	BASIC ELECTRONICS & COMMUNICATION ENGINEERING
ECOL04	MICROPROCESSORS & INTERFACING	ECOL05	DIGITAL IMAGE PROCESSING
EEOL01	RENEWABLE ENERGY SOURCES	EEOL02	UTILIZATION OF ELECTRICAL ENERGY
EEOL03	POWER CONVERTERS	EEOL04	ENERGY CONSERVATION
EEOL05	INTRODUCTION TO ELECTRIC VEHICLES AND STORAGE SYSTEMS	MEOL01	AUTOMOTIVE ENGINEERING
MEOL02	ROBOTIC ENGINEERING	MEOL03	INTRODUCTION TO OPERATIONS RESEARCH
MEOL04	MECHATRONICS	MEOL05	APPLIED MECHANICS & MECHANICAL ENGINEERING

CS/IT 261	Operating Systems Lab	L	T	P	C
		0	0	4	2

Course Objectives:
Students will gain practical experience with designing and implementing concepts of operating systems such as system calls, CPU scheduling, process management, memory management, file systems and dead lock handling in a programming language.

Course Outcomes

1. Implement basic services and functionalities of operating system using system calls.
2. Analyze and simulate CPU scheduling algorithms and classical problems of synchronization.
3. Implement memory management schemes, dead lock handling mechanisms and page replacement algorithms.
4. Simulate file allocation and organization techniques.

1. Simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time.

    a) FCFS b) SJF c) Round Robin (pre-emptive) d) Priority

2. Simulate multi-level queue scheduling algorithm considering the following scenario. All the processes in the system are divided into two categories – system processes and user processes. System processes are to be given higher priority than user processes. Use FCFS scheduling for the processes in each queue.

3. Simulate the following file allocation strategies.
   a) Sequential b) Indexed c) Linked

4. Simulate the MVT and MFT memory management techniques.

5. Simulate the following contiguous memory allocation techniques
   a) Worst-fit b) Best-fit c) First-fit

6. Simulate paging technique of memory management.

7. Simulate Bankers algorithm for the purpose of deadlock avoidance.

8. Simulate disk scheduling algorithms
   a) FCFS b) SCAN c) C-SCAN

9. Simulate page replacement algorithms
   a) FIFO b) LRU c)Optimal d)LFU

10. Simulate producer-consumer problem using semaphores.

11. Simulate the concept of Dining-Philosophers problem.

CS/IT 262	Database Management Systems Lab	L	T	P	C
		0	0	4	2

Course Objectives:

At the end of the course the students will understand

1. Syntax and usage of DDL, DML, DCL, and TCL statements, asserting database integrity constraints during database creation.
2. Semantics of SQL for implementing the user queries on a relational database.
3. Block structured PL / SQL programming concepts.

Course Outcomes:

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

1. Define, manipulate and control data using Structured Query Language (SQL).
2. Identify various database integrity constraints during database creation.
3. Construct SQL statements for satisfying end user queries by utilizing functions, set operations, joins, and subqueries.
4. Develop various applications using various PL/SQL data object like Database cursors, Functions, Stored Procedures, Packages, and Triggers.

Note:

1) Two Lab cycles on various databases to be prepared in advance before the commencement of the semester and students are required to create and maintain a database by using concepts from 1 to 2. Each lab cycle must to include more than 30 queries in order to satisfy all possible user requests may a database expect during usage by covering the concepts from 3 to 7.

2) Third lab cycle is to be prepared and given in advance to the students in order to write PL/SQL programs by covering concepts from 8 to 12.

1. DDL Commands.
   - a. Creating objects: tables and views.b. Altering the Schema of objects
   - c. Dropping the objects

2. DML Commands
   - a. Inserting data into a databaseb. Modifying data in a database
   - c. Deleting data from a database
3. Simple queries: selection, projection, sorting on a simple table
   - a. Small-large number of attributesb. Distinct output values
   - c. Renaming attributesd. Computed attributes
   - e. Simple-complex conditions (AND, OR, NOT)
   - f. Partial Matching operators (LIKE, %, _, *,?) . ASC-DESC ordering combinations
   - h. Checking for Nulls

4. Multi-table queries (JOIN OPERATIONS) Simple joins
   - a. Aliasing tables - Full/Partial name qualification Inner-joins (two and more (different) tables)
   - b. Inner-recursive-joins (joining to itself)
   - c. Outer-joins (restrictions as part of the WHERE and ON clauses)
   - d. Using where & having clauses
5. Nested queries
   - a. In, Not In
   - b. Exists, Not Exists
   - c. Dynamic relations (as part of SELECT, FROM, and WHERE clauses)

6. Set Oriented Operations
    a. Union b. Differencec. Intersection d. Division

7. TCL Commands
    a. Privilege management through the Grant/Revoke commands
    b. Transaction processing using Commit/Rollback
    c. Save points.

8. PL/SQL named and unnamed blocks

9. PL/SQL Implicit and Explicit Cursors

10. PL/SQL pre-defined and user defined exceptions

11. PL/SQL stored procedures, functions and packages

12. PL/SQL database triggers

MC 003	Essence of Indian Traditional Knowledge	L	T	P	C
		2	0	0	0

Course Objectives:
To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

Course Outcomes:
At the end of the course, students will be able to
1. Understand the concept of traditional knowledge and its importance.
2. Apply significance of traditional knowledge protection.
3. Analyze the various enactments related to the protection of traditional knowledge.
4. Evaluate the concepts of intellectual property to protect the traditional knowledge and the traditional knowledge in different sectors.

Course Content:

UNIT I **CO 1** 8 Periods

Introduction to traditional knowledge: Definition of traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, characteristics, the historical impact of social change on traditional knowledge systems, traditional knowledge Vs western knowledge, traditional knowledge vis-à-vis formal knowledge.

UNITII **CO 2** 8 Periods

Protection of traditional knowledge: the need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT III **CO 3** 8 Periods

A: Legal frame work and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006; Plant Varieties Protection and Farmer's Rights Act, 2001 (PVPFR Act).
B: The Biological Diversity Act 2002 and Rules 2004 and the protection of traditional knowledge bill, 2016.

UNIT IV **CO 4** 8 Periods

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge,Traditional knowledge in different sectors: Engineering, medicine system, biotechnology and agriculture, Management of biodiversity, Food security of the country and protection of TK.

Learning Resources:

Text Book:

1. Traditional Knowledge System in India, by Amit Jha, ATLANTIC Publishers, 2009.

References Books:

1. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashanPublishers, 2012.
2. "Knowledge Traditions and Practices of India" by Kapil Kapoor and Michel Danino.

Web References:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. https://nptel.ac.in/courses/121106003/

CS V04	Programming with Python	P	T	P	C
		2	0	2	0

Course Objectives:

At the end of the course the students will understand

1. Data types and control structures.
2. Procedural programming features of python.
3. File handling power of python.
4. Object oriented programming in python.

Course Outcomes:

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

1. Manipulate various types of data in python.
2. Apply procedure oriented features of python.
3. Develop applications for manipulating files.
4. Apply Object oriented programming features of python.

Course Content:

UNIT I **15 Periods**

Data and Expressions- Literals, Variables and Identifiers, Operators, Expressions and Data Types.
Control Structures - What Is a Control Structure? Boolean Expressions (Conditions), Selection Control, Iterative Control.

UNIT II **15 Periods**

Lists - List Structures, Lists (Sequences) in Python, Iterating Over Lists (Sequences) in Python, More on Python Lists.
Functions- Program Routines, More on Functions.
Objects and Their Use - Software Objects, Turtle Graphics.

UNIT III **15 Periods**

Modular Design – Modules, Python Modules.
Text Files - What Is a Text File? Using Text Files, String Processing, Exception Handling.
Dictionaries and Sets - Dictionary Type in Python, Set Data Type.

UNIT IV **15 Periods**
Object-Oriented Programming - What Is Object-Oriented Programming? Encapsulation, Inheritance, Polymorphism.
Recursion - Recursive Functions, Recursive Problem Solving, Iteration vs. Recursion.

Learning Resources:

Text Book:

1. Introduction to Computer Science Using Python: A Computational Problem-Solving Focus by Charles Dierbach, Wiley.

Reference Books:

1. Beginning python from novice to professional by Magnus Lie Hedland, 2nd Edition, Apress
2. Programming in Python 3 – A complete introduction to the Python Language by Mark Summerfield, Pearson,
3. Learning Python by Mark Lutz, 5th Edition, O'Reilly
4. Programming Python by Mark Lutz, 4th Edition, O'Reilly .

III/IV B.Tech - V Semester

CS/IT 311	Computer Networks	L	T	P	C
		3	0	0	3

Course Objectives

1. Fundamental concepts of computer networks.
2. Different error control, flow control techniques and Collision-Free Protocols.
3. Various routing, congestion control algorithms and QoS techniques.
4. Design issues of transport layer and protocols of application layer.

Course Outcomes

1. Compare ISO reference model with TCP/IP and determine various guided media.
2. Verify the transmission errors using error detection and correction methods.
3. Apply various routing algorithms and compare IPv4.0 and IPv6.0.
4. Contrast various transport layer services and apply different application layer protocols.

Course Content:

UNIT I 14 Periods

Introduction: Network Hardware, Network Software, Reference Models.
Physical Layer: The theoretical basis for data communication, Guided media, digital modulation and multiplexing, switching.

UNIT II 12 Periods

The Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols.
The Medium Access Control Sub-layer: Multiple Access Protocols- ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Ethernet**,** Data Link Layer Switching.

UNIT III 12 Periods

The Network Layer: Network Layer Design Issues, Routing Algorithms-Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast routing, multicast routing, Congestion control algorithms, Quality of Service-Application Requirements, Traffic Shaping, Packet Scheduling, Admission Control, Internetworking, The Network Layer in the Internet-The IP version 4.0 protocol, IP Addresses, IP Version 6.0, Internet Control Protocols, Label Switching and MPLS

UNIT IV 12 Periods

The Transport Layer: The Transport Service-Services Provided to the Upper Layers, Transport Service Primitives, Elements of Transport Protocols –Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, Congestion control-Desirable Bandwidth allocation, Regulating the sending rate, The Internet Transport Protocols: Introduction to UDP, Remote procedure call, Real-Time transport protocols, Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.
The Application Layer: DNS- The Domain Name System, Electronic mail, world wide web.
Learning Resources:

Text Book:

1. Andrew S. Tanenbaum, David J.Wetherall, Computer Networks, Fifth Edition, Pearson Education.

Reference Books:

1. James F.Kurose, Keith W.Ross, Computer Networking, Third Edition, Pearson Education
2. Behrouz A Forouzan, Data Communications and Networking, Fourth Edition, TMH (2007).
3. Kurose & Ross, *COMPUTER NETWORKS*, A Top-down approach featuring the Internet, Pearson Education, Alberto Leon, Garciak.

CS/IT 312	Design & Analysis of Algorithms	L	T	P	C
		3	0	0	3

Course objectives:

1. Ability to analyse time and space complexity.
2. Strengthen basic paradigms.
3. Acquaintance of algorithm design strategies.
4. Expertise with a variety of significant algorithms.

Course outcomes

1. Analyse the performance of algorithms and Develop solutions for complex problems using Divide and Conquer Strategy.
2. Articulate on graph problems and Design Greedy solution for complex problems.
3. Relate and Develop optimal solutions for complex problems using Dynamic Programming.
4. Design and Improve all possible solutions for a problem using Backtracking and Branch and Bound and Compare the P and NP complex problems.

Course Content:

UNIT I 12 Periods

Introduction: Algorithm Design paradigms – motivation, concept of algorithmic efficiency, run time analysis of algorithms, Asymptotic Notations.

Divide and Conquer: General Method, Merge Sort, Quick sort, Strassen Multiplication Analysis of divide and conquer run time recurrence relations.

UNIT II 12 Periods

Greedy Programming: General Method, Knapsack problem, Tree Vertex Splitting, Job Sequencing with Dead Lines, Minimum Spanning Tree – Prim's and Kruskal's algorithms, Single Source Shortest-Paths-Dijkstra's.
Basic search and Traversal Techniques: Techniques for graphs, connected components and spanning trees, bi connected components.

UNIT III 14 Periods

Dynamic Programming: General Method, Multi Stage Graph, All Pairs Shortest Paths, Single Source Shortest Paths-general Weights, Optimal Binary Search Trees, String Editing, 0/1 Knapsack, Reliability Design, Traveling Salesman Problem, flow shop scheduling.

UNIT IV 12 Periods

Back tracking: General Method, 8-queen problem, Sum of Subsets, Graph Coloring, Hamiltonian cycles, 0/1 Knapsack.

Branch and Bound: Least Cost, 15 puzzle problem, Control Abstraction for LC Search, Bounding, FIFO branch and bound, LC branch and bound, 0/1 Knapsack problem, Travelling Salesman Problem.
NP-Hard and NP – Complete problems: basic concepts, Cook's theorem

Learning Resources:

Text Book:

1. E. Horowitz, S. Sahni and S.Rajsekaran, "Fundamentals of Computer Algorithms", Galgotia Publication.

Reference Books:

1. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer Algorithm", PHI.
2. Sara Basse, A.V. Gelder, "Computer Algorithms", Addison Wesley.

CS/IT 313	Web Technologies	L	T	P	C
		3	0	0	3

Course Objectives:

At the end of the course the students will understand

1. Basic technologies to develop web documents.
2. Dynamic HTML Pages and Event handling mechanism.
3. XML, Web Servers, Java Servlet technologies.
4. Java Server Page Technologies.

Course Outcomes:

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

1. Create web pages with HTML, CSS, and JavaScript.
2. Design dynamic webpages using client side scripting.
3. Create XML documents and work with web servers to develop Server side web applications with Java Servlets.
4. Design and develop server side programs with Java Server Pages.

Course Content:

UNIT I 12 Periods

Introduction to HTML5 Part - I & II.
Cascading Style Sheets (CSS) Part - I & II.
JavaScript: Introduction to Scripting, Control Statements Part - I & II.

UNITII 14 Periods

JavaScript: Functions, Arrays, Objects.
DOM Objects and Collections
JavaScript Event Handling

UNITIII 12 Periods

XML: XML Basics, XML Namespaces, DTD, XML Schema, MathML, XSL & XSLT.
Web Servers (IIS and Apache).
Introduction to Java Servlets, Static and Dynamic contents, Servlet life Cycle and Life cycle methods, Servlet Request and Response Model, Deploying a Servlet, Servlet State Transitions, Servlet Config and ServletContext, Servlet Redirection and Request Dispatch, Servlet Synchronization and Thread Model. Maintaining Client State: Cookies, URL rewriting, Hidden form fields, Session Tracking.

UNITIV 12 Periods

Introduction to JSP, JSP & Servlet as Web Components, Servlets vs. JSP, JSP Lifecycle, JSP Page Lifecycle Phases, General Rules of Syntax, JSP syntactic elements, JSP element syntax, Template content. JSP elements-directives, declarations, expressions, scriptlets, actions. JSP Standard Actions: jsp:useBean, jsp:getPreoperty, jsp:setProperty, jsp:include, jsp:forward, jsp:plugin, jsp:param,java Server Pages Standard Tag Library(JSTL).

Learning Resources:

Text Book:

1. Harvey M. Deitel and Paul J.Deitel, "Internet & World Wide Web How to Program", 4/e, Pearson Education.
2. SubrahmanyamAllamaraju and Cedric Buest, "Professional Java Server Programming: J2EE" (UNIT III and UNIT IV (Servlets and JSP)).

Reference Books:

1. Jason Cranford Teague "Visual Quick Start Guide CSS, DHTML & AJAX", 4/ e, "Pearson Education".
2. Tom NerinoDoli Smith "JavaScript & AJAX for the Web" Pearson Education, 2007.
3. Bill Dudney, Johathan Lehr, Bill Willies, Lery Mattingly "Mastering Java Server Faces" Wiely India, 2006.
4. Web Technology - UttamK.Roy, Oxford University Press, 2010.

Web References:

1. www.deitel.com
2. www.w3schools.com
3. www.tutorialspot.com

CS/IT 314	Software Engineering	L	T	P	C
		3	0	0	3

At the end of the course, the student will understand

1. The basic concepts on Software Engineering Methods and Process Models.
2. The agile software development with a comprehensive set of skills appropriate to the needs of the dynamic global computing-based society**.**
3. How requirements are Modelling and design.
4. Quality management and how to ensure good quality software by applying various Testing Strategies.

Course outcomes

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

1. Apply the software engineering lifecycle.
2. Analyze and specify software requirements.
3. Design, develop and deploy software projects.
4. Evaluate and assess the quality of the software.

Course Content:

UNIT I 12Periods

Software and Software Engineering: The nature of Software, Software Engineering, The Software Process, Software Engineering Practice.
The software Process: Process models, Prescriptive Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models
Specialized Process models: Component based Development, The Formal Methods Model, Aspect Oriented Software Development.
The Unified Process: Phases of the Unified Process.

UNIT II 13Periods

Agile Development: What Is Agility? What Is an Agile Process? Agile process models: Adaptive Software Development, Extreme Programming, Scrum, Dynamic Systems Development Method, Crystal, Feature driven Development, Lean Software Development and Agile Modeling. Agile Project Management Philosophy.
Understanding Requirements: Requirements Engineering, Establishing the Groundwork, eliciting requirements, Developing Use Cases, Building the requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III 12Periods

Requirements Modelling: Scenarios, Information, and Analysis Classes: Requirement Analysis, Scenario-based Modelling, UML Models That Supplement the Use Case, Data Modelling Concepts, Class Based Modelling.

Design Concepts: Design within the Context of Software Engineering, The Design Process, Design Concepts, **The Design Model:** Data Design Elements, Architectural Design Elements, Interface Design Elements, Component-Level Design Elements.

UNIT IV 13Periods

Quality Management: What is Quality?, Achieving Software Quality, Cost Impact of Software Reviews, Defect amplification and removal, Informal and Formal Reviews, Elements of SQA, Software Reliability.
Software Testing Strategies: A Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging.
Testing Conventional Applications: Software testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Model-Based Testing.

Learning Resources:

Text Book:
1. Roger S. Pressman, Software Engineering - A Practitioner's Approach, Seventh Edition, McGraw Hill Publications.

Reference Books:
1. UgrasenSuman, Software Engineering, Concepts and Practices, Cengage Publications,
2. Ian Sommerville, Software Engineering, Sixth Edition, Pearson Education.
3. Agile Project Management: Best Practices and Methodologies - https://www.altexsoft.com/whitepapers/agile-project-management-best-practices-and-methodologies/
4. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, Second Edition, PHI.
5. Rajib Mall, Fundamentals of Software Engineering, Second Edition, PHI.
6. Software Engineering Resources : - www.rspa.com/spi/
7. Carnegie Mellon University, Software Engineering Institute, www.sei.cmu.edu/

		L	T	P	C
CS/IT 315	**Professional Elective-I**	**3**	**0**	**0**	**3**

CS/IT 316	Open Elective-II	L	T	P	C
		3	0	0	3

CS/IT 351	Design & Analysis of Algorithms Lab	L	T	P	C
		0	0	4	2

Course objectives:
Students will gain practical exposure with designing and implementing different algorithms design strategies such as Divide and Conquer, Greedy method, Dynamic Programming, Backtracking and Branch and Bound.

Course outcomes

1. Device an algorithm with appropriate design strategy.
2. Implement the algorithm in a high level language.
3. Analyze the performance of algorithms using language features.

Design, implement and test the programs for the following problems in any programming language:

1. Find the min-max of list of elements using DAC.

2. Find the kth smallest element using DAC.

3. Calculate the optimal profit of a Knapsack using Greedy method.

4. Determine the path length from a source vertex to the other vertices in a given graph.

(Dijkstra's algorithm)

5. Construct minimum cost spanning tree for the given graph. (Kruskal's algorithm)

6. Determine shortest path in a multi stage graph using forward and backward approach.

7. Find Shortest path from any node to any other node(All pairs Shortest path) within a graph.

8. Construct spanning trees using DFS and BFS graph traversals.

9. Find the bi-connected components in a graph

10. Find the non attacking positions of Queens in a given chess board using backtracking

Technique.

11. Color the nodes in a given graph such that no two adjacent can have the same color using

backtracking Technique.

12. Calculate the optimal profit of a Knapsack using Branch and Bound Technique.

CS/IT 352 **Web Technologies Lab**

L	T	P	C
0	0	4	2

Course Objectives: At the end of the course the students will understand

1. Recognize the basic technologies to develop web documents.
2. Acquire Knowledge on Dynamic HTML Pages and Event handling mechanism.
3. Awareness on the application of XML, Web Servers, Java Servlet technologies.
4. Knowledge on the concepts related to Java Server Page Technologies.

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

1. Create web pages with HTML, CSS, and JavaScript.
2. Design and develop dynamic webpages using client side scripting.
3. Create XML documents and develop Server side web applications with Java Servlets.
4. Design and develop client- server applications with Java Server Pages.

List of Experiments

1. Develop a simple static website using XHTML.
2. Develop a simple static web page using different types of styles in CSS.
3. Write java scripts covering Function, recursive functions, Arrays and Objects.
4. Write a program on collection objects.
5. Write a program on event bubbling and mouse event model.
6. Write well-formed and valid XML documents.
7. Write code for displaying XML using XSL.
8. Write a program on simple servlets.
9. Write programs on cookie and session.
10. Write a program on simple JSP.
11. Write a program on JSP action tags.

Web References:

1. www.deitel.com
2. www.w3schools.com
3. www.tutorialspot.com

CS/IT 353	Software Engineering Lab	L	T	P	C
		0	0	4	2

Course Objectives:

At the end of the course, the student will understand

1. the importance of a component and functionality of each UML model element throughout the software engineering process.
2. how to read and interpret the artifacts of requirements that are used as starting points for analysis and design.
3. Identify and understand interaction among various design model elements.
4. analyze and design a model or a software component for a particular application or software project

Course Outcomes:

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

1. describe the importance of systems analysis and design in solving computer Based problems.
2. develop UML models which are used during the phases of the Rational Unified Process.
3. illustrate interactions among analysis classes for developing the class model and identify the dynamic behavior of the system.
4. propose deployment of object-oriented software for client in detail.

LAB CYCLE 01

ANALYSIS

1. Problem Statement
2. Requirements elicitation
3. System Requirements Specification

USECASE VIEW

4. Identification of Actors.
5. Identification of Use cases.
6. Flow of Events.
7. Construction of Use case diagram.
8. Building a Business Process model using UML activity diagram Lab.

LAB CYCLE 02

LOGICAL VIEW

9. Identification of Analysis Classes.
10. Identification of Responsibilities of each class.
11. Construction of Use case realization diagram.
12. Construction of Sequence diagram.
13. Construction of Collaboration diagram.
14. Identification of attributes of each class.
15. Identification of relationships of classes.
16. Analyzing the object behavior by constructing the UML State Chart diagram.
17. Construction of UML static class diagram. Lab Cycle - III

LAB CYCLE 03

DESIGN AND IMPLEMENTATION

18. Refine attributes, methods and relationships among classes.
19. Construction of UML component diagrams.
20. Construction of UML deployment diagrams.

MINI PROJECT

The above three cycles are to be carried out in the context of a problem / information system chosen by the Project batch and a report is to be submitted to the department by the end of the semester.

CS/IT 321	Compiler Design	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand different phases of compiler and lexical analyzer.
2. To study about parsing techniques and syntax direct translation schemes.
3. To know about run-Time storage allocations strategies and Symbol Table implementation.
4. To understand different intermediate code forms and code generation.

Course Outcomes:

1. Implement Lexical Analyzer and top-down parsing mechanisms.
2. Construct bottom-up parsing techniques and create symbol tables.
3. Design SDT Schemes &various Intermediate code forms.
4. Apply code generation, optimization techniques and runtime allocation strategies.

Course Content:

UNIT I (CO1) 13 Periods

Introduction to Compiling: Compilers - Analysis of the source program - Phases of a compiler - Cousins of the Compiler - Grouping of Phases - Compiler construction tools.

Lexical Analysis: Role of Lexical Analyzer - Input Buffering - Specification of Tokens-Recognition of tokens- a language for specifying lexical analyzers- Finite Automata-From Regular expressions to NFA- Design of a lexical analyzer generator.

Syntax Analysis: Role of the parser - Top Down parsing - Recursive Descent Parsing, Predictive Parsing, LL(1) Parser.

UNIT II (CO2) 13 Periods

Syntax Analysis - Bottom-up parsing - Shift Reduce Parsing, Operator Precedent Parser – Operator precedence parsing, Operator Precedence functions, Error recovery in operator precedence parsing, LR Parsers - SLR Parser, Canonical LR Parser, and LALR Parser- Parser Generators.

Symbol Tables: Symbol table entries, Data structures for symbol table implementation, representing scope information.

UNIT III (CO3) 12 Periods

Syntax Directed Translation: Syntax Directed definition- construction of syntax trees, Bottom-up evaluation of S-attribute Definitions-L-attribute Definitions.

Intermediate Code Generation: Intermediate languages – SDT scheme for Assignment Statements - SDT scheme for Case Statements-SDT scheme for Boolean Expressions, SDT scheme for Flow of control constructs - SDT scheme for Procedure calls.

UNIT IV (CO4) 12 Periods

Code Generation: Issues in the design of code generator - The target machine - Runtime Storage management - Basic Blocks and Flow Graphs - Next-use Information - A simple Code generator - DAG representation of Basic Blocks.

Code Optimization: Introduction- Principal Sources of Optimization - Optimization of basic Blocks - Introduction to Global Data Flow Analysis- Peephole Optimization.

Run Time Environments: Source Language issues - Storage Organization - Storage Allocation strategies –Static allocation scheme, Stack allocation scheme, Heap allocation scheme- Access to non-local names - Parameter Passing methods- Call-by-Value, Call-by-Reference, Call-by-Name methods.

Learning Resources:

Text Book:

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and Tools", Pearson Education Asia, 2007.

Reference Books:

1. Alfred V.Aho, Jeffrey D. Ullman, Principles of Compiler Design, Narosa publishing, 2002.
2. Lex &Yacc - John R. Levine, Tony Mason, Doug Brown, 2nd Edition, O'reilly
3. Engineering a Compiler - Keith Cooper & Linda Torezon, 2nd Edition Elsevier.

CS/IT 322	Data Engineering	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand basics of data warehousing and data mining.
2. To learn data pre-processing and association rule mining techniques.
3. To know about classification & Clustering techniques.
4. To use applications of data mining on complex data objects.

Course Outcomes:

1. Explain the fundamental concepts of data warehousing and mining.
2. Extract association rules from transactional databases.
3. Demonstrate different classification techniques.
4. Apply various clustering and outlier detection techniques.

Course Content:

UNIT I (CO1) 13 Periods

Data Warehousing and Online Analytical Processing: Data Warehouse: Basic Concepts-Data Warehouse
Modeling: Data Cube and OLAP-Data Warehouse Design and Usage- Data Warehouse Implementation.
Getting to know Your Data: Data Objects and Attribute Types- Basic Statistical Descriptions of Data- Measuring Data Similarity and Dissimilarity.
Data Preprocessing: An overview of Data Preprocessing**-** Data cleaning- Data Integration- Data Reduction- Data Transformation and Data Discretization.

UNIT II (CO1 & CO2) 12 Periods

Introduction - Data Mining: Why Data Mining- What is Data Mining? -What Kinds of Data can be mined? - What Kinds of Patterns can be mined? - Which Technologies are used? - Major Issues in Data Mining.
Mining Frequent Patterns, Associations, and Correlations: Basic Concepts- Frequent Item set Mining Methods: Apriori Algorithm, Generating Association Rules, Improving the efficiency of Apriori, FP Growth Approach for Mining
Frequent Item Sets, Mining Frequent Item Sets using Vertical Data Format Method.
Advanced Pattern Mining: Mining Multilevel Associations- Mining Multidimensional Associations-Mining
Quantitative Association Rules-Mining Rare Patterns and Negative Patterns- Constrained based Frequent Pattern Mining.

UNIT III (CO3) 12 Periods

Classification: Basic Concepts- Decision tree induction- Bayes Classification Methods- Rule-Based Classification-
Model Evaluation and Selection- Techniques to Improve Classification Accuracy.
Advanced Methods in Classification: Bayesian Belief Networks-Classification by Backpropagation-Classification by Support Vector Machines-Lazy Learners-Other Classification Methods.

UNIT IV (CO4) 13 Periods

Cluster Analysis: Introduction to cluster analysis- partitioning methods- Hierarchical methods- Density-Based
Methods: DBSCAN-Grid-basedMethod: STING, Outliers and Outlier Analysis- Outlier Detection Methods.
Data Mining Trends: Mining Sequence Data- Mining Graphs and Networks- Mining Other Kinds of Data- Data Mining Applications.

Learning Resources

Text Book:

1. Data Mining Concepts & Techniques, Jiawei Han, Micheline Kamber, and Jian Pei, 3/e, Morgan Kaufmann Publishers.

Reference Books*:*

1. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, Addison Wesley.
2. Data Warehouse Toolkit, Ralph Kimball, John Wiley Publishers.

CS/IT 323	Artificial Intelligence	L	T	P	C
		3	0	0	3

Course Objectives:

1. To present fundamental concepts and problem solving methodologies of artificial intelligence.
2. To learn logical representation of natural language sentences.
3. To understand the role of various planning techniques in solving problems.
4. To describe how to develop an expert system for given knowledge base.

Course Outcomes:

1. Apply heuristic search techniques for solving simple AI problems.
2. Represent the given natural language sentences in predicate/proposition logic as rules for inferring new knowledge using forward/ backward reasoning.
3. Represent the given natural language information as weak or strong slot-and-filler structures and discuss various planning techniques.
4. Explain the concepts of expert systems.

Course Content:

UNITI 12 Periods

Problems, Problem Spaces and Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, and Issues in the Design of Search Programs. Heuristic Search Techniques: Generate-and-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

UNIT II 14 Periods

Knowledge Representation Using Predicate Logic: Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution. Representing Knowledge Using Rules: Procedural versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching, Control Knowledge.

UNIT III 14 Periods

Slot – And – Filler Structures: Semantic Nets, Conceptual Dependency, Scripts. Planning: Overview - An Example Domain: The Blocks Word, Component of Planning Systems, Goal Stack Planning, Non-linear Planning using constraint posting, Hierarchical planning, Reactive systems.

UNIT IV 10Periods

Expert Systems: Representing and using domain knowledge, Expert system shells, Explanation, Knowledge Acquisition.

Learning Resources:

Text Book:

1. Elaine Rich & Kevin Knight, 'Artificial Intelligence', 2nd Edition, (TMH).

Reference Book:

1. Patrick Henry Winston, 'Artificial Intelligence', Pearson Education.

CS/IT 324	Cryptography & Network Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To develop an understanding of the architecture of network security.
2. To narrate and evaluate the design principles of symmetric encryption.
3. To implement the public key encryption techniques.
4. To discuss various authentication protocols.
5. To describe the web security and network security applications.

Course Outcomes:

1. Explain the network security vulnerabilities/attacks and symmetric encryption schemes.
2. Describe public key encryption techniques and mathematical foundations for cryptography.
3. Explain authentication anddigital signature protocols.
4. Discuss the authentication applications, web and E-mail securitymechanisms.

Course Content:

UNIT I Text Book-1 13 Periods

Introduction: Services, Mechanisms and attacks-the OSI security Architecture-Network security model.
Classical Encryption techniques: (Symmetric cipher model, substitution techniques, transposition techniques, steganography).

Number Theory: Prime numbers-Fermat's and Euler's theorem- Testing for primality -The Chinese remainder theorem- Discrete logarithms.

UNIT II Text Book-2 13 Periods

Block Ciphers & Public Key Cryptography

Traditional Block Cipher structure-Data Encryption Standard-Strength of DES- Block Cipher design principles-Advanced Encryption Standard (AES) structure-AES transformation function-AES key expansion - Block Cipher Modes of Operation.
Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management
Other Public Key Crypto Systems: Diffie Hellman Key exchange -Elgamal Crypto System.

UNIT III ` Text Book-2 12 Periods

Hash Functions and Digital Signatures
Cryptographic Hah Functions: Applications of cryptographic hash functions- Hash function based on CBC mode – SHA512
Message Authentication codes: MAC requirements - MAC functions- HMAC.
Digital signatures- Digital Signatures- ELGamalDSS .
Key management and Distribution: Symmetric key distribution using Symmetric and asymmetric encryption- Distribution of public keys- X.509 Certificates.

UNIT IV Text Book-2 12 Periods

Web Security Practice

User authentication: Kerberos.
Transport Level Security: SSL-TLS.
E-Mail Security: PGP.
IP Security: Overview- IP Security Policy -Encapsulating Security Payload.

Learning Resources:

Text Book:

1. William Stallings, Cryptography and Network Security, 4th Edition, Pearson Education.
2. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education.

Reference Books:

1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007.
2. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
3. Charles Pfleeger, "Security in Computing", 4th Edition, Prentice Hall of India, 2006.
4. Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.
5. Charlie Kaufman and Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication in Public World", PHI 2002.
6. Bruce Schneier and Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dreamtech India Pvt Ltd, 2003.
7. Douglas R Simson "Cryptography – Theory and practice", First Edition, CRC Press, 1995.
8. http://nptel.ac.in/.

CS/IT 325	**Professional Elective-II**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

CS/IT 326	**Open Elective-III**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

CS/IT 361	Artificial Intelligence Lab	L	T	P	C
		0	0	4	2

Course Objectives:

1. To learn how to solve AI problems using informed and uninformed search techniques.
2. To learn how to develop solutions for the given problems using AI techniques
3. To learn about various Python packages that are used for solving AI problems

Course Outcomes:

1. Apply heuristic search techniques for solving simple AI problems.
2. Implement solutions to problems using uninformed search techniques.
3. Develop solutions to the given problems using natural language processing.
4. Solve the given problems using Python.

List ofPrograms:

1. Basic Python Programs.
2. Programto solve Water Jug Problem.
3. Solve any problem using Breadth First Search Technique.
4. Solve any problem using Depth First Search Technique
5. Solve any problem using Best First Search.
6. Solve any problem using A* Algorithm.
7. Solve any problem using AO* Algorithm.
8. Implement simple Chatbot.
9. Write a program to solve Tic-Tac-Toe game.
10. Write a program to perform classification for the give sentence.

		L	T	P	C
CS/IT 362	**Project-I**	**0**	**0**	**4**	**2**

		L	T	P	C
CS/IT 363	**Term Paper**	**0**	**0**	**4**	**2**

IV/IV B.Tech - I Semester

CS/IT 411	Machine Learning	L	T	P	C
		3	0	0	3

Course Objectives:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To develop skills of using recent machine learning software for solving practical problems.
3. To gain experience of doing independent study and research.

Course Outcomes:

1. Describe the concepts of learning.
2. Explain various learning algorithms.
3. Discuss the principles of inductive and analytical learning.
4. Discuss the basics of reinforcement learning.

Course Content:

UNIT I 13 Periods

Introduction: Need - Relevant Disciplines - Learning Problem - Designing a Learning System - Perspectives and Issues -Evaluating Hypothesis.

Concept Learning: Concept Learning: Task - Finding a Maximally Specific Hypothesis - Version Spaces and Candidate Elimination Algorithm - Inductive Bias. Bayesian Learning: Bayes Theorem - Maximum Likelihood - Least Square Error Hypotheses - Bayes Optimal Classifier - Bayesian Belief Network.

UNIT II 14 Periods

Decision Trees and Ann: Decision Tree Learning: Representation - Applications - Algorithm - Inductive Bias – Issues. Artificial Neural Networks: Motivation - Representation - Application - Perceptron's - Multilayer Networks - Back Propagation Algorithm.

Instance Based Learning: Instance Based Learning: KNN Learning - Locally Weighted Regression - Radial Bias Functions- Case-Based Reasoning.

UNIT III 13 Periods

Inductive and Analytical Learning: Learning Sets of Rules: Sequential Covering Algorithm - Learning Rule Sets -Learning First Order Rules - Induction as Inverted Deduction - Inverting Resolution. Analytical Learning: Learning with Perfect Domain Theories. Explanation Based Learning: Combining Inductive and Analytical Learning.

UNIT IV 10 Periods

Reinforcement Learning: Learning Task - Q Learning - Non Deterministic Rewards and Actions - Temporal Difference Learning - Generalizing from Examples - Relationship to Dynamic Programming.

Learning Resources:

Text Book:

1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

Reference Books:

1. EthemAlpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning)‖, The MIT Press 2004.
2. Stephen Marsland, —Machine learning: An Algorithmic Perspective‖, CRC Press, 2009

CS/IT 412	Neural Networks	L	T	P	C
		3	0	0	3

Course Objectives:

1. To introduce some of the fundamental techniques and principles of neural computation.
2. To investigate some common models and their applications.

Course Outcomes:On completion of this course, a student should be able to:

1. Explain the features of single and multilayer neural networks.
2. Discussdifferent learning mechanisms of Hopfield, Kohonen, SOM and LVQ networks.
3. Implement common learning algorithms Adaptive resonance theory.
4. Describe back propagation neural networks to classification and recognition problems.

Course Content:

UNIT I 13 Periods

Introduction, Simple Neural Networks for Pattern Classification: General Discussion, HebbNet, Perceptron, Adaline.

UNIT II 13 Periods

Discrete Hopfield Net, Hamming Net, Kohonen Self-Organizing Maps, Learning VectorQuantization.

UNIT III 10Periods

Adaptive Resonance Theory: Introduction, ART1, ART2.

UNIT IV 14 Periods

Standard Back Propagation Neural Net, Gaussian Machine, Cauchy Machine, Boltzmann Machine with Learning, Simple Recurrent Net.

Learning Resources:

Text Book:

1. Fundamentals of Neural Networks – Laurence Fausett, Pearson Education.2004.

Reference Books:

1. Introduction to Neural Networks Using Matlab 6.0- S.N. Sivanandam, S. Sumathi, S.N. Deepa.
2. Neural Networks – James A.Freeman/ David A.Skapura,Pearson Education.
3. Neural Networks – Simon Haykin – 2nd edition, Pearson Education.

		L	T	P	C
CS/IT 413	**Professional Elective-III**	**3**	**0**	**0**	**3**

		L	T	P	C
CS/IT 414	**Professional Elective-III**	**3**	**0**	**0**	**3**

		L	T	P	C
CS/IT 415	**Humanities Elective-II**	**3**	**0**	**0**	**3**

CS/IT 451	Machine Learning Lab	L	T	P	C
		0	0	2	1

Course Objectives:

1. Demonstrate the basic concepts and techniques of Machine Learning.
2. Develop skills of using recent machine learning software for solving practical problems.
3. Provide experience of doing independent study and research.

Course Outcomes:

1. Implement supervised learning techniques.
2. Write programs to solve problems using reinforcement learning.
3. Develop solutions to the problems usingunsupervised learning.

List of Programs:

1. Implement and demonstrate the FIND-S algorithm to finding the most specific hypothesis based on a given set of data samples. Read the training data from a .CSV file.

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

6. Assuming a set of documents that need to be classified, use the naïve Bayesian classifier model to perform this task. Built-in Java classes /API can be used to write the program. Calculate the accuracy precision and recall for your data set.

7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis the of heart patients using standard heart disease data set. You can use Java or Python ML Library classes /API.

8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using K-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java / Python ML library classes/API in the program.

9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set your experiment and draw graphs.

CS/IT 452	Project-II	L	T	P	C
		0	0	4	2

IV/IV B.Tech - II Semester

CS/IT 421	**PROFESSIONAL ELECTIVE-V(MOOCS)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
CS/IT 422	**OPEN ELECTIVE-VI(MOOCS)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
CS/IT 461	**Project-III**	**L**	**T**	**P**	**C**
		0	**0**	**12**	**6**

Elective courses

CSEL01	Unix programming	L	T	P	C
		3	0	0	3

Course Objectives

At the end of the course, the students will understand

1. UNIX Architecture and its key features.
2. Different UNIX commands and AWK programming.
3. Functions of UNIX shells and the concepts of Bourn shell programming.
4. File and process management system calls and signal handling mechanism in UNIX.
5. PC mechanisms like pipes, sockets, shared memory, and semaphores and UNIX internals.

Course Outcomes

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

1. **Apply** UNIX commands for **solving** problems.
2. **Develop** AWK andshell scripts for **solving** problems that can't be solved by simple commands.
3. **Apply** system calls for system programming.
4. **Create** client/server applications using IPC mechanisms.

Course Content:

UNIT I 15 Periods

Introduction: UNIX architecture, Features of UNIX.
UNIX Utilities: pwd, mkdir, ls, cd , rmdir, cat, more, page, head, tail, Editing a file: vi, cp, mv, rm, wc, ln, unlink, chmod, chown, chgrp, who, sort, nl, grep, egrep, fgrep, find, cmp, diff, uniq, tr, sed, cut, paste, join, tee, tty.

UNIT II 15 Periods

Programmable text processing: **AWK** - awk programs, accessing individual fields, Begin and end, operators, variables, control structures, extended regular expressions, condition ranges, field separators, Built - in functions.
UNIX Shells: Introduction, shell functionality, Built - in commands, meta characters, input/output redirection, filename substitution, pipes, command substitution, sequences, grouping commands, background processing, scripts, subshells, shell variables, Quoting
Bourne Shell: Working with variables, Arithmetic, conditional expressions, control structures, positional parameters, passing command line arguments, shell programs, functions, and arrays.

UNIT III 16 Periods

File Management: Introduction to system calls and file management, Regular file management system calls - open( ), read( ), write( ), lseek( ), Close(), unlink( ),stat( ), getdents( ). Miscellaneous file management system calls - chown( ) and fchown( ), chmod( ) and fchmod( ), dup( ) and dup2( ), fcntl( ), ioctl( ), link( ), mknod( ), sync( ), truncate( ) and ftruncate( ).
Process Management: Creating a new process - fork( ), orphan processes, terminating a process - exit( ), zombie processes, waiting for a child - wait( ), Differentiating a process - exec( ), changing directories - chdir( ), changing priorities- nice( ), Accessing user and Group ID's.

Signals: Introduction, A list of signals, terminal signals, Requesting an Alarm signal - alarm( ), handling signals - signal( ), protecting critical code and chaining interrupt handlers, sending signals - kill( ), Death of children, suspending and Resuming processes, process Group's and control terminals.

UNIT IV 15 Periods

Inter process communication: Pipes, Sockets, shared memory and semaphores.
UNIX Internals: Kernel Basics, the File System, Process Management, Memory Management, Input/Output.

Learning Resources:

Text Book:

1. Unix for programmers and users, Graham Glass, King Ables, 3rd edition, Pearson education.

Reference Books:

1.Behrouz A. Forouzan, Richard F. Gilberg : UNIX and Shell Programming- Cengage Learning – India Edition. 2009.
2. W. Richard Stevens, Advanced programming in the unix environment, 3rd Edition Pearson education.
3. Kernighan W.Brian and Pike Rob, Unix programming environment, Pearson education.
4. Sumitabha Das, Your Unix the ultimate guide, TMH 2rd edition.
5. Marc J.Rochkind, Advanced UNIX programming, 2nd edition Pearson Education.
6. Meeta Gandhi, Rajiv Shah, TilakShetty, The "C" Odyssey UNIX - The Open, Boundless C, BPB Publications.

Web References:

1. www.webreference.com › Programming
2. www.iu.hio.no/~mark/unix/unix.html

CSEL02	Interactive Computer Graphics	L	T	P	C
		3	0	0	3

Course objectives

At the end of the course, the students will understand

1. Recognize computer graphics system, design algorithms and two dimensional transformations.
2. Illustrate with techniques of clipping, three dimensional graphics and three dimensional transformations.

Course outcomes

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

1. **Recognize** the fundamental concepts and **Design** algorithms for output primitives
2. **Design** 2-D transformations and **Design** Clipping algorithms
3. **Illustrate** 3-D object representation and **Develop** 3-D Transformation algorithms
4. **Design** 3-D projection and **Develop** Animation

Course Content:

UNIT I 17 Periods

Introduction: Basic concepts, Application areas of Computer Graphics, overview of graphics systems - video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations, input devices and their logical classifications, Hard copy devices and Graphics software.

Output primitives: Points and lines, line drawing algorithms - DDA, Bresenham's, mid-point circle and ellipse algorithms, Filled area primitives - Scan line polygon fill algorithm, inside-outside tests, boundary-fill and flood-fill algorithms, character generation and Antialiasing.

UNIT II 17 Periods

2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Liang-Barsky line clipping algorithms, Sutherland - Hodgeman polygon clipping algorithm.

UNIT III 15 Periods

Three Dimensional Concepts: 3-D Display method, 3-D object representation: Polygon surfaces, Curved lines and surfaces, quadric surfaces, spline representation, Bezier curve and surfaces.

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

UNIT IV 15 Periods

3-D viewing: Viewing pipeline, viewing coordinates, projections, view volume and general projection transforms and clipping.

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications.

Learning Resources:

Text Book:

1. "Computer Graphics C version", Donald Hearn and M.Pauline Baker, Pearson Education 2nd Edition.

Reference Books:

1. "Computer Graphics Principles & Practice", Second Edition in C, James.D.Foley, AndriesVanDam, Steven K.Feiner and Hughes, Pearson Education.
2. "Computer Graphics", Steven Harrington, TMH.
3."Computer Graphics Second edition", Zhigand Xiang, Roy Plastock, Schaum's outlines, Tata Mc-Graw Hill edition.
4. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw Hill, 2nd edition.
5. "Principles of Interactive Computer Graphics", Willam.M.Neuman and Robert.F.Sproul, TMH.

6. Principles of Computer Graphics, ShaliniGovil, Pai, 2005, Springer.

Web References:

1. http://kat.ph/hearn-baker-computer-graphics-c-version-2nd 5edt3295235.html
2. http://users.abo.fi/jawester/compgraph/
3. http://research.cs.wisc.edu/graphics/Courses/559-s2002/cs559.html
4. http://www.cs.umd.edu/~mount/427/Lects/427lects.pdf

CSEL03	Big Data Analytics	L	T	P	C
		3	0	0	3

Course Objectives:

At the end of the course the students will understand

1. Big data analytics techniques.
2. Techniques required to manage and analyze big data problems.
3. principles in achieving big data analytics with scalability and streaming capability.
4. techniques to solve complex real-world analytics problems.

Course Outcomes:

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

1. demonstrate the key issues in big data management and its associated applications.
2. apply fundamental enabling techniques and scalable algorithms in big data analytics.
3. interpret models for similarity and distance measures.
4. build data stream models and apply analytics principles.

Course Content:

UNIT I Text Book-1 10 Periods

Overview of Big Data: What is Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics.

Understanding Hadoop Eco-system: Hadoop EcoSystem, Hadoop Distributed File System, Hadoop YARN, Introducing HBase, Combining HBase and HDFS, Hive, Pig, Sqoop, ZooKeeper, Flume.

NoSQL Data Management: Introduction to NoSQL, Types of NoSQL data models,Key Value Data Model, Column Oriented Data Model, Document Data Model, Graph Databases, Schema-Less Databases, Materialized Views, Distribution Models, Sharding.

UNIT II Text Book-2 15 Periods

Data Mining: What is Data Mining?, Statistical Limits on Data Mining. Things useful to know.

Map Reduce Software Stack: Distributed File Systems, Map Reduce, Algorithms Using Map Reduce, Extensions to Map Reduce, The Communication Cost Model.

Finding Similar Items: Applications of Near-Neighbor Search, Shingling of Documents, Similarity-Preserving Summaries of Sets, Locality-Sensitive Hashing for Documents, Distance Measures.

UNIT III Text Book-2 15 Periods

Mining Data Streams: The Stream Data Model, Sampling Data in a Stream, Filtering Streams. Mining, Counting Distinct Elements in a Stream.

Link Analysis: Page Rank, Efficient Computation of Page Rank, Topic-Sensitive Page Rank, Link Spam.

Social-Network Graphs: Social Networks as Graphs, Clustering of Social-Network Graphs, Direct Discovery of Communities, Partitioning of Graphs.

UNIT IV Text Book-1 10 Periods

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics, Points to consider during Analysis, Developing an Analytic Team, Understanding Text Analytics.

Exploring R: Variables in R, Working with Vectors, Storing and Calculating values in R, Creating and using objects, Executing Scripts,, Creating Plots.

Reading Dataset and Exporting Data from R:c() command, scan() Command, Reading multiple data values from large files, exporting data from R, creating subsets in dataframes.

Learning Resources:

Text Books:

1. BIG DATA Black Book, Dreamtech Press, 2015.
2. Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, Mining of Massive Datasets, 2nd Edition, 2014.

Reference Books:

1. Taming the Big Data Tidal Wave: Finding Opportunities in huge data streams with advanced analytics, Bill Franks, Wiley Publishers, 2010.
2. Understanding Big data: Analytics for enterprise class Hadoop and streaming data, Paul Zikopoulos, Chiris Eaton, McGraw Hill Education.

Web-References:

1. Big Data computing course of Dr. Rajiv Misra is available @ https://nptel.ac.in/courses/106104189/
2. Yahoo! Hadoop Tutorial available @ https://developer.yahoo.com/hadoop/tutorial/
3. Googld Apache tools Tutorials available @ https://cloud.google.com/dataproc/docs/tutorials
4. IBM Hadoop Dev Tutorials available @ https://developer.ibm.com/hadoop/docs/biginsights-ibm-open-platform/getting-started/tutorials/

CSEL04	Embedded Systems	L	T	P	C
		3	0	0	3

Course Objectives:
At the end of the course the students will understand

1. Fundamental concepts of embedded systems.
2. Basic principles of designing embedded system software and architectures.
3. Various services offered by RTOS.
4. Embedded system development environment.

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

1. Identify suitable hardware components for design of embedded systems in satisfying real world design challenges.
2. Propose various embedded software architecture for design of ES.
3. Assess services provided by RTOS and embedded software design principles.
4. Articulate hardware and software tools needed for building ES and describe the debugging process in embedded systems.

UNIT I 15 periods

A First Look at the Embedded Systems: Examples of Embedded Systems (Telegraph, cordless Bar-code scanner, Laser Printer, underground tank monitor, Nuclear Reactor Monitor),
Typical Hardware. Hardware Fundamentals: Terminology, Gates, A few other basic considerations, Timing Diagrams, Memory.
Advanced Hardware Fundamentals: Micro Processors, Buses, Direct Memory Access, interrupts, other common parts, Built-ins on the Micro Processor, conventions used on the Schematics.

UNIT II 15 periods

Interrupts: Micro Processor Architecture, Interrupt Basics, The shared data problem, Interrupt Latency.
Survey of Software Architectures: Round-Robin, Round-Robin with Interrupts, Function Queue-Scheduling Architecture, Real Time Operating System Architecture, Selecting an Architecture.

UNIT III 10 periods

Introduction to Real Time Operating Systems: Tasks and Task states, Tasks and data Semaphores and shared data.
More Operating System Services: Message Queues, Mail boxes and pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS environment.

UNIT IV 10 periods

Basic Design Using a Real Time Operating System: Overview, Principles, An Example, Encapsulating Semaphores and Queues, Hard Real Time Considerations, Saving Memory Space, Saving Power.
Embedded Software Development Tools: Host and Target Machines, Linker/Locators for Embedded Software, Getting Embedded Software into the target System.

Debugging Techniques: Testing on Host Machine, Instruction Set Simulators, the assert macro, using Laboratory Tools.

Learning Resources:

Text Book:

1. David E.Simon, An Embedded Software Primer, Pearson Education Asia., 2000.

Reference Books:

1. SriramV.Iyer, Pankaj Gupta, Embedded Real-time Systems Programming, Tata McGraw Hill publishers, 2004.
2. D.Gajski, F.Vahid, S.Narayan, J.Gong, Specification and Design of Embedded Systems, Prentice Hall of India Pvt. Ltd.
3. Raj Kamal, Embedded Systems Architecture & Programming, Tata McGraw-Hill.

CSEL05	Open Source Systems	L	T	P	C
		3	0	0	3

Course Objectives

At the end of the course, the students will understand

1. Learn to use PHP for developing web applications.
2. Learn the PHP Browser Handling Power.
3. Learn to access web form data at the server
4. Learn how to create database driven web applications.
5. Learn to use Ajax for partial rendering.
6. Learn to use XML and RSS with PHP.

Course Outcomes

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

1. **Develop** web applications using Apache and PHP
2. **Apply** the OOP concepts of PHP
3. **Develop** database driven web applications using PHP and MySQL.
4. **Design and develop** powerful web applications using Ajax, XML and RSS.

Course Content:

UNIT I 15 Periods

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc.,

File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT II 15 Periods

PHP Authentication and Methodologies: Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package.

UNIT III 15 Periods

AJAX: What is Ajax? , Ajax Architecture ,Overview of Important Concepts of JavaScript ,XMLHttpRequest, Onreadystatechange, Ajax using HTML, JavaScript & DOM, Ajax using PHP & MySQL.

Classes & Objects (OOP's):

Class ,What is an Object, Features of OOP's ,Abstraction, Encapsulation, Inheritance ,Polymorphism, new keyword, Scope-resolution operator, Access Specifiers (public/private/protected),Method Overriding, Why PHP does not support Method Overloading, Constructor, Destructor ,autoload(), Functions, calling a function, Abstract Class , Interface .

UNIT IV 15 Periods

Generating Images with PHP: Creating Image, Manipulating Image, Using text in Image.

Database Connectivity with MySql: Introduction to RDBMS, Connection with MySql Database, Performing basic database operation (DML) (Insert, Delete, Update, Select) ,Setting query parameter ,Executing query ,Join (Cross joins, Inner joins, Outer Joins, Self joins.)

Learning Resources:

Text Books:

1. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill.

Reference Books:

1. Open Source Web Development with LAMP using Linux Apache,MySQL,PerlandPHP,J.Lee and B.Ware(Addison Wesley) Pearson Education.
2. Programming Python,M.Lutz,SPD.
3. PHP 6 Fast and Easy Web Development ,JulieMeloni and Matt Telles, Cengage Learning Publications.
4.PHP 5.1,I.Bayross and S.Shah,The X Team,SPD. Advanced PHP for Web Professionals By Christopher Cosentino Published Oct 29, 2002 by Prentice Hall.
5. Beginning PHP and MySQL , 3rd Edition , Jason Gilmore,Apress Publications (Dreamtech).

CSEL06	Digital Image Processing	L	T	P	C
		3	0	0	3

Course objectives

At the end of the course the students will understand the

1. Fundamental concepts in digital image processing and enhancement in spatial domain.
2. Approaches used in enhancement in frequency domain and image segmentation.
3. Image restoration and image compression techniques.
4. Morphological transformations, and image representation and description.

Course outcomes

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

1. Define image processing systems, and develop algorithms for image enhancement techniques in spatial domain.
2. Develop enhancement techniques in frequency domain and image segmentation
3. Develop image restoration, and image compression techniques.
4. Implement morphological transformation algorithms, and select various descriptors for image representation.

Course Content:

UNIT I 12 Periods

Introduction: Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. Digital Image Fundamentals: Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic Relationships between Pixels.

Image Enhancement in the Spatial Domain: Some Basic Gray Level Transformation, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, smoothing spatial Filters, Sharpening spatial Filters.

UNIT II 14 Periods

Image Enhancement in the Frequency Domain: Introduction to the Fourier Transform and the Frequency Domain, smoothing frequency domain Filters, Sharpening frequency-domain Filters, Holomorphic Filtering, Implementation.

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation.

UNIT III 14 Periods

Image Restoration: A Model of the Image Degradation/Restoration Process, Linear, Position-Invariant Degradations, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering.

Image Compression: Image Compression Models, Error-free Compression, Lossy Compression, Image Compression Standards.

UNIT IV 12 Periods

Morphological Image Processing: Dilation and Erosion, The Hit-or-Miss Transformation, Some basic Morphological Algorithms, Extension to Gray-Scale Images.

Representation and Description: Representation, Boundary Descriptors, Regional Descriptors.

Learning Resources:

Text Book:

1. Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing' Addison Wesley Pubs (Second Edition).

Reference Books:

1. Image Processing. Analysis, and Machine Vision, Milan Sonka, Vaclav Hlavac, Roger Boyle (Second Edition).
2. A.K.Jain, 'Fundamentals of Digital Image Processing' PHI.

CSEL07	Network Programming	L	T	P	C
		3	0	0	3

Course objectives

At the end of the course the students will understand the

1. client/server programming design issues and protocols.
2. elementary TCP/UDP system calls.
3. performance of server process using threads.
4. TCP client/server design alternatives.

Course outcomes

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

1. Explain the basics of transport layer and network programming.
2. Create a client/server applications using elementary TCP socket functions.
3. Design and develop client/server programs using UDP sockets.
4. Implement client/Server program using threads and compare different TCP client/server design alternatives.

Course Content:

UNIT I 15 Periods

Introduction:

A Simple Daytime Client , Protocol independence, Error Handling, A Simple Daytime Server, OSI model, Unix Standards, 64 bit architectures.

The Transport Layer:

Introduction, User datagram Protocol (UDP), Transmission Control Protocol (TCP), TCP Connection Establishment and Termination, TIME_WAIT State, Port Numbers, TCP Port Numbers and Concurrent Servers, Buffer Sizes and Limitations, Standard Internet Services, Protocol Usage

Sockets Introduction:

Introduction, Socket Address structures, Value-Result Arguments, Byte Ordering Functions, inet_aton, inet_addr,andinet_ntoa Functions, inet_pton and inet_ntop Functions.

UNIT II 15 Periods

Elementary TCP Sockets:

Introduction, socket Function, connect Function, bind function, listen function, accept Function, fork and exec Functions, Concurrent Servers, close Function, getsockname and getpeername Functions

TCP Client-Server Example:

Introduction, TCP Echo Server: main Function, TCP Echo Server: str_echo Function, TCP Echo Client: main Function, TCP Echo Client: str_cli Function, Normal Startup, Normal Termination, POSIX Signal Handling, Handling SIGCHLD Signals, wait and waitpid Functions, Connection Abort before accept Returns, Termination of Server Process, SIGPIPE Signal, Crashing of Server Host, Crashing and rebooting of Server Host

I/O Multiplexing: The select and poll Functions:

Introduction, I/O Models, select Function, str_cli Function, Batch Input and Buffering, shutdown Function, str_cliFunction,TCP Echo Server,pselectFunction,pollFunction,TCP Echo Server

UNIT III 15 Periods

Elementary UDP Sockets:
Introduction, recvfrom and sendto Functions, UDP Echo Server: main Function, UDP Echo Server:dg_echo Function, UDP Echo Client: main Function, UDP Echo Client:dg_cli Function, Lost Datagrams, Verifying Received Response, Server Not Running, Summary of UDP Example, connect Function with UDP, dg_cli Function (Revisited), Lack of Flow Control with UDP, Determining Outgoing Interface with UDP,TCP and UDP echo Server Using select

Daemon Processes and the inetdSuperserver:
Introduction, syslogd Daemon, syslog Function, daemon_init Function, inetd Daemon, daemon_inetd Function

UNIT IV 15 Periods

Threads:
Introduction, Basic Thread Functions: Creation and Termination, str_cli Function Using Threads, TCP Echo Server Using Threads, Web Client and Simultaneous Connections, Multexes:Mutual Exclusion, Condition Variables, Web Client and Simultaneous Connections .

Client/Server Design Alternatives:
Introduction, TCP Client Alternatives, TCP Test Client, TCP Iterative Server, TCP Concurrent Server, One Child per Client, TCP Preforked Server, No Locking Around accept, TCP Preforked Server, File Locking Around accept, TCP Preforked Server, Thread Locking Around accept, TCP Preforked Server, Descriptor Passing, TCP Concurrent Server, One Thread per Client, TCP Prethreaded Server, per-Thread accept, TCP Prethreaded Server, Main Thread accept.

Learning Resources:

Text Book:

1. W.Richard Stevens, Bill Fenner, Andrew M. Rudoff, Unix Network Programming. The Sockets Networking API, Volume 1 , 3rd edition – 2004.

Reference Books:

1. Douglas E.Comer, David L.Stevens, Internetworking With TCP/IP: Design, Implementation and Internals,prentice hall,1991.
2. Rochkind, Advanced Unix Programming, Addison-Wesley Professional, 2nd edition.

Web References:

1. http://www.pearsoned.co.in/wrichardstevens
2. http://www.iana.org

CSEL08	Mobile Application Development	L	T	P	C
		3	0	0	3

Course Objectives:

To provide knowledge on tools required for Mobile Application Development using Android.

1. To provide knowledge on Android User Interface using Views.
2. To provide knowledge on Data Persistence.
3. To make the student to learn Messaging in Android.

Course Outcomes:

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

1. Develop the basic Android App using Activity Lifecycle methods.
2. Design Android User Interfaces & Event Handling mechanisms.
3. Design and Implement back end Android App using SQLite database.
4. Develop messaging services in Android Apps.

Course Content:

UNIT I 15 Periods

Android Programming: What Is Android? Obtaining the Required Tools, Creating Your First Android Application.

Android studio for Application development: Exploring IDE, Using code completion, debugging your Application, Generating a signed APK.

Activities, Fragments, and Intents: Understanding Activities, Linking Activities Using Intents, Fragments, Displaying Notifications.

UNIT II 15 Periods

Android User Interface: Components of a Screen, Adapting To Display Orientation, Managing Changes to Screen Orientation, Utilizing the Action Bar, Creating the User Interface Programmatically.

User Interface with Views: Using Basic Views, Using Picker Views, Using List Views To Display Long Lists, Understanding Specialized Fragments.

UNIT III 15 Periods

Pictures and Menus with Views: Using Image Views to Display Pictures, Using Menus with Views, Using Web View.

Notifications – Creating and Displaying notifications, Displaying Toasts.

Data Persistence: Saving and Loading User Preferences, Persisting Data to Files, Creating and Using Databases.

UNIT IV 15 Periods

Content Providers: Using a Content Provider, Creating Your Own Content Providers.

Messaging: SMS Messaging, Sending E-Mail.

Learning Resources:

Text Book:

1. Beginning Android Programming with Android Studio, J.F.DiMarzio, Wiley India (Wrox), 2017.

Reference Books:

1. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India (Wrox), 2012.
2. Reto Meier, Professional Android 4 Application Development, Wiley India, (Wrox), 2012.
3. James C Sheusi, Android Application Development for Java Programmers, Cengage Learning, 2013.

CSEL09	Internet of Things	L	T	P	C
		3	0	0	3

Course Objectives:

1. Classify the interconnection and integration of the physical world and IoT devices.
2. Interpret the various IoT applications and its infrastructures
3. Relate the concept of setting up IOT Devices with Python.
4. Describe the concepts of interfacing hardware to develop IoT projects.

Course Outcomes:

1. Explain the physical and logical design of IoT.
2. Discuss the application areas of IoT.
3. Demonstrate IoT applications using Raspberry Pi.
4. Design an IoT application using sensors, actuators and controllers

Course Content:

UNIT I 9 Periods

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT,IoT Protocols, IoT communication models, IoT Communication APIs

IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems

UNIT II 12 Periods

IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

Python Introduction: Variables, Numbers, Strings-python examples**,** Launching Programs from Python, Troubleshooting Errors, Basic Input and Output - Using Inputs and Outputs

UNIT III 12 Periods

Programming Inputs and Outputs with Python: Installing and Testing GPIO in Python, Blinking an LED, Reading a Button.

Creating the sensor project - Preparing Raspberry Pi - Clayster libraries - Hardware- Interacting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data - External representation of sensor values - Exporting sensor data

UNIT IV 12 Periods

PREPARING IOT PROJECTS:

Creating the actuator project: Hardware - Interfacing the hardware

Creating a controller for IoT project - Representing sensor values - Parsing sensor data - Calculating control states
Creating a camera for IoT project - Hardware -Accessing the serial port on Raspberry Pi - Interfacing the hardware - Creating persistent default settings - Adding configurable properties - Persisting the settings - Working with the current settings - Initializing the camera

Learning Resources:

Text Books:
1. Arshdeep Bahga and Vijay Madisetti, Internet of Things A Hands-on Approach, Universities Press, 2015, ISBN: 9788173719547.

2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan

Reference Books:
1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 – 2024.

2. Peter Friess,'Internet of Things – From Research and Innovation to Market 4. Deployment', River Publishers, 2014 5. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

Web References:
1. http://postscapes.com/.
2. http://www.theinternetofthings.eu/what-is-the-internet-of-things.
3. https://www.youtube.com/channel/UCfY8sl5Q6VKndz0nLaGygPw.
4. https://www.codeproject.com/Learn/IoT/.

CSEL10	Object–Oriented Analysis and Design (OOAD)	L	T	P	C
		3	0	0	3

Course Objectives

At the end of the course, the student will understand

1. the fundamental concepts of object-oriented software development and UML Notations.
2. UML diagrams for Object Oriented Analysis and Design.
3. design architectures and patterns for object oriented software development.
4. implementation strategies and object oriented project management approaches.

Course Outcomes

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

1. develop the requirements model through behavioral model and specify the dynamic behavior of the system.
2. design interaction diagrams and state machines in an information system.
3. design architectures and identify a reusable design models using design patterns.
4. model boundary classes, Implement, test and manage a software project.

Course Content:

UNIT I 15 Periods

Information Systems- Introduction, Information systems in practice, General system theory, Information and information systems, Problems in Information Systems Development, Avoiding the Problems.
Modelling Concepts: Models and diagrams, Drawing Activity Diagrams, Unified Software Development Process;
Requirements Capture: User Requirements, Fact Finding Techniques, User Involvement, Documenting Requirements, Use Cases, Requirements Capture and Modelling;
Agate Ltd Case study - Introduction to Agate Ltd., Requirements Model.
Requirements Analysis: What Must a Requirements Model Do? Use Case Realization, The Class Diagram, Drawing a Class Diagram, CRC Cards, Assembling the Analysis Class Diagram.

UNIT II 15 Periods

Refining the Requirements Model: Component based development, Adding further structure, Software development patterns.
Object Interaction: Object Interaction and Collaboration, Interaction Sequence Diagrams, Interaction Collaboration Diagrams, Model Consistency;
Specifying Operations: The Role of Operation Specifications, Contracts, Describing Operation Logic, Object Constraint Language, Creating an Operation Specification;
Specifying Control: States and Events, Basic Notation, Further Notation, preparing a Statechart, Consistency Checking, Qualify Guidelines;

UNIT III 15 Periods

Moving Into Design: How is Design Different from Analysis?, Logical and Physical Design, System Design and Detailed Design, Qualities and objectives of Analysis and Design, Measurable Objectives in Design, Planning for Design.
System Design: The Major Elements of System Design, Software Architecture. Concurrency, Processor Allocation, Data Management Issues, Development Standards, Prioritizing Design Trade-offs, Design for Implementation;

Object Design: Class Specification, Interfaces, Criteria for Good Design, Designing Associations, Integrity Constraints, Designing Operations, Normalization;
Design Patterns: Software Development Patterns, Documenting Patterns-Pattern Templates, Design Patterns, How to Use Design Patterns, Benefits and Dangers of Using Patterns;

UNIT IV 15 Periods

Designing Boundary Classes: The Architecture of the Presentation Layer, Prototyping the User Interface, Designing Classes, Designing Interaction with Sequence Diagrams, The Class Diagram Revisited, User Interface Design Patterns, Modelling the Interface Using State charts;
Implementation: Software Implementation, Component Diagrams, Development Diagrams, Software Testing, Data Conversion, User Documentation and Training, Implementation Strategies, Review and Maintenance;
Managing Object-Oriented Projects: Resource Allocation and Planning through CPA method and Gantt charts method, Managing Iteration, Dynamic Systems Development Method, Extreme Programming.

Learning Resources:

Text Book:

1. Object-Oriented Systems Analysis And Design Using UML - Simon Bennett, Steve McRobb and Ray Farmer - Tata McGraw-Hili Edition – 2nd Edition.

Reference Books:

1. James Rumbaugh, Jacobson, Booch, Unified Modeling Language Reference Manual, 2nd Edition, PHI.
2. Jacobson et al., The Unified Software Development Process, AW, 1999.
3. AtulKahate, Object Oriented Analysis &Design, The McGraw-Hill Companies, 2004.
4. The Unified Modeling Language User Guide -Grady Booch ,James Rumbaugh and Ivar Jacobson, Addison-Wesley Object Technology Series,2nd edition.

CSEL11	Distributed Computing	L	T	P	C
		3	0	0	3

Course objectives:

At the end of the course, the student will understand

1. The model of distributed computations and clock synchronization.
2. Synchronous and asynchronous communication in distributed systems.
3. Various mutual exclusion and deadlock detection algorithms.
4. Distributed shared memory model for consistency, and distributed system recover.

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

1. Describe a model of distributed computing and clock synchronization.
2. Design of various global state, snapshot recording algorithms and compare synchronous versus asynchronous communication.
3. Plan various distributed mutual exclusion algorithms and solve deadlocks in distributed systems.
4. Identify distributed shared memory model for consistency and apply the check pointing and rollback recovery for distributed systems.

Course Content:

UNIT I 12 Periods

Introduction: Definitions, Motivation, Relation to parallel multiprocessor/multicomputer systems, Message passing systems versus shared memory systems, Primitives for distributed communication, synchronous versus asynchronous execution, design issues and challenges.

A Model of Distributed Computations: A Model of distributed executions, Models of communication networks, Global state of a distributed system, Cuts of a distributed computation, Past and future cones of an event, Models of process communication.

Logical Time: A framework for a system of Logical clocks, scalar time, vector time, efficient implementation of vector clocks, Matrix time, Physical clock synchronization: NTP.

UNIT II 12 Periods

Global State and Snapshot Recording Algorithms: System model, Snapshot algorithms for FIFO channels, Variations of Chandy-Lamport algorithm, Snapshot algorithms for non-FIFO channels, Snapshots in a causal delivery system, Monitoring global state, Necessary and sufficient conditions for consistent global snapshots.

Message Ordering and Group Communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order, A nomenclature for multicast, Propagation trees for multicast, Classification of application-level multicast algorithms, Semantics of fault-tolerant group communication, Distributed multicast algorithms at the network layer.

UNIT III 12 Periods

Termination Detection: System model of a distributed computation, Termination detection using distributed snapshots, Termination detection by weight throwing, A spanning- tree-based termination detection algorithm, Message-optimal termination detection, Termination detection in a very general distributed computing model, Termination detection in the atomic computation model.

Distributed Mutual Exclusion Algorithms: Preliminaries, Lamport's algorithm, Ricart–Agrawala algorithm, Singhal's dynamic information-structure algorithm, Lodha and Kshemkalyani's fair mutual exclusion algorithm, Quorum-based mutual exclusion algorithms, Maekawa's algorithm.

Deadlock Detection in Distributed Systems: System model, Preliminaries, Models of

deadlocks, Knapp's classification of distributed deadlock detection algorithms, Mitchell and Merritt's algorithm for the single resource model, Chandy–Misra–Haas algorithm for the AND model, Chandy–Misra– Haas algorithm for the OR model.

UNIT IV 15 Periods

Distributed Shared Memory: Abstraction and advantages, Memory consistency models, Shared memory mutual exclusion.

Check Pointing and Rollback Recovery: Issues in failure recovery, Checkpoint based recovery, Log-based rollback recovery, Koo–Toueg coordinated check pointing algorithm, Juang–Venkatesan algorithm for asynchronous check pointing and recovery, Manivannan–Singhal quasi-synchronous checkpointing algorithm.

Consensus and agreement algorithms: Problem definition, Overview of Results, Agreement in (message-passing) synchronous systems with failures.

Learning Resources:

Text Book:

1. Ajay D. Kshemakalyani, MukeshSinghal, Distributed Computing, Cambridge University Press, 2008.

Reference Book:

1. Andrew S. Tanenbaum, Maarten Van Steen, Distributed Systems Principles and Paradigms, Prentice Hall India, 2004.

CSEL12	Principles of Programming Languages	L	T	P	C
		3	0	0	3

Course objective

At the end of the course, the student will understand

1. Know the various programming languages environment, syntax, scope and binding.
2. Different data types, control flows and construction of syntax tree.
3. Constructs of functional programming and object oriented programming.
4. Recognize the features of logic languages and scripting languages.

Course outcomes

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

1. Construct programming language syntax and describe about names, scopes and bindings.
2. Compare different data types and list different control flows.
3. Determine various features of functional and object oriented programming languages,
4. Outline theoretical foundations of logic programming languages and scripting languages.

Course Content:

UNIT I 12 Periods

Introduction
The Art of Language Design, Why Study Programming Languages, The Programming Language Spectrum, Compilation and Interpretation, Programming Environments, An Overview of Compilation.

Programming Language Syntax
Specifying Syntax: Regular Expressions and Context-Free Grammars, Scanning, Parsing, Theoretical Foundations

Names, Scopes, and Bindings
The Notion of Binding Time, Object Lifetime and Storage Management, Scope Rules, Implementing Scope, The Meaning of Names within a Scope, The Binding of Referencing Environments, Macro Expansion.

UNIT II 12 Periods

Semantic Analysis
The Role of the Semantic Analyzer, Attribute Grammars, Evaluating Attributes, Action Routines, Space Management for Attributes, Decorating a Syntax Tree.

Control Flow
Expression Evaluation, Structured and Unstructured Flow, Sequencing, Selection, Iteration, Recursion, Nondeterminacy.

Data Types
Type Systems, Type Checking, Records (Structures) and Variants (Unions), Arrays, Strings, Sets, Pointers and Recursive Types, Lists, Files and Input/Output, Equality Testing and Assignment.

UNIT III 12 Periods

Subroutines and Control Abstraction
Review of Stack Layout, Calling Sequences, Parameter Passing, Generic Subroutines and Modules, Exception Handling, Coroutines, Events.
Data Abstraction and Object Orientation
Object-Oriented Programming, Encapsulation and Inheritance, Initialization and Finalization, Dynamic Method Binding.
Functional Languages
Historical Origins, Functional Programming Concepts, A Review/Overview of Scheme, Evaluation Order Revisited, Higher-Order Functions, Theoretical Foundations, Functional Programming in Perspective

UNIT IV 12 Periods

Logic Languages: Logic Programming Concepts, Prolog, Theoretical Foundations, Logic Programming inPerspective.
Concurrency
Background and Motivation, Concurrent Programming Fundamentals, Implementing Synchronization, Language-Level Mechanisms, Message Passing.
Scripting Languages
What Is a Scripting Language, Problem Domains, Scripting the World Wide Web, Innovative Features.

Learning Resources:

Text Book:

1. "**Programming Language Pragmatics**" Third Edition**, Michael L. Scott**, Morgan Kaufmann, 2009.

Reference Books:

1. Robert W. Sebesta, "**Concepts of Programming Languages**", Eight Edition, Addison Wesley.
2. "**Programming Languages, Principles & Paradigms**", 2ed, Allen B Tucker, Robert E Noonan, TMH
3. R. Kent Dybvig, "**The Scheme programming language**", Fourth Edition, MIT Press, 2009.
4. W. F. Clocksin and C. S. Mellish, "**Programming in Prolog: Using the ISO Standard**", Fifth Edition, Springer, 2003

		L	T	P	C
CSEL13	***Industry Recommended Subject**	**3**	**0**	**0**	**3**

CSEL14	Advanced Computer Architecture	L	T	P	C
		3	0	0	3

Course Objectives:

1. To make students know about the Parallelism concepts in Programming.
2. To give the students an elaborate idea about the different memory systems and buses.
3. To introduce the advanced processor architectures to the students.
4. To make the students know about the importance of multiprocessor and multi-computers.
5. Relate the data flow computer architectures and arithmetic algorithms

Course Outcomes:

1. Describe the concepts of parallel processing and its performance metrics.
2. Compare the linear and non- linear pipelined processor performance.
3. Describe high performance, scalable, multithreaded and multiprocessor systems.
4. Discuss the issues related to parallel models, languages and compilers.

Course Content:

UNIT I 12 Periods

Parallel Computer Models: The state of computing, Classification of parallel computers, Multiprocessors and Multicomputers, Multivector and SIMD computers.
Program and network properties: Conditions of parallelism, Data and resource Dependences, Hardware and Software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture, Demand driven mechanisms, Comparisons of flow mechanisms.
System Interconnect Architectures: Network properties and routing, Static interconnection Networks, Dynamic interconnection Networks, Multiprocessor system Interconnects, Hierarchical bus systems, Crossbar switch and multi-port memory, Multistage and combining network.

UNIT II 14 Periods

Principles of Scalable Performance: Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws - Amdahl's law for fixed load, Gustafson's law for scaled problems, Memory Bounded Speedup Model.
Pipelining: Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch prediction, Arithmetic Pipeline Design, Computer Arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines.

UNIT III 12 Periods

MULTI Processors: Multiprocessor System Interconnect, Cache Coherence and Synchronization Mechanisms, Message-passing Mechanisms.
Scalable, Multi-Threaded and Dataflow Architectures: Latency-Hiding Techniques, Principles of Multithreading, Scalable and Multithreaded Architectures.

UNIT IV 12 Periods

Parallel Models, Languages and Compilers: Parallel Programming Models, Parallel Languages and Compilers, Dependence analysis of Data Arrays.
Parallel Models, Languages and Compilers: code optimization and Scheduling, Loop parallelization and pipelining.

Learning Resources:

Text Book:
1. Kai Hwang, "Advanced Computer Architecture"; TMH. 3rd Edition.2016.

Reference Books:
1. D.A. Patterson and J.L.Hennessey, "Computer organization and Design", Morgan Kaufmann, 2nd Edition.
2. V.Rajaram&C.S.R.Murthy, "Parallel Computer Architecture and programming", PHI Learning Pvt.Ltd., 2016 Edition
3. Barry Wilkinson and Michael Allen, "Parallel Programming", Pearson Education.

CSEL15	Design and Analysis of Parallel Algorithms	L	T	P	C
		3	0	0	3

Course Objectives:

1. Realize the usebasic sequential algorithms and Describe about basic parallel algorithms.
2. Describe and use basic data structures; know about the existence of advanced data structures.
3. Describe and use the main design techniques for sequential algorithms.
4. Analyze message-passing based parallel algorithms in C using the MPI library.

Course Outcomes:

1. Elucidate the parallel computing models, and differentiate between sequential and parallel algorithms.
2. Analyze the parallel algorithms for CRCW, CREW, EREW models.
3. Identify the correctness and analyze the computational complexity of sequential algorithms.
4. Differentiate among several algorithms solving the same problem under different conditions.

Course Content:

UNIT I 13 Periods

Introduction to Parallel Algorithms: Models of Computation – Analyzing Algorithms, Selection-The Problem and a lower Bound, A Sequential algorithm, Desirable Properties of Parallel algorithm, An algorithm for parallel Selection.

Merging: A Network for Merging, Merging on the CREW and EREW Models – A better Algorithm for the EREW model.

UNIT II 12 Periods

Sorting: A network for Sorting, sorting on a Linear Array, Sorting on CRCW, CREW, EREW Models

Searching: Searching a Sorted Sequence – Searching a Random Sequence, Searching on a tree, searching on Mesh.

UNIT III 12 Periods

Generating Permutations and Combinations: Sequential Algorithms, generating permutations in Parallel, generating combinations in Parallel.

Matrix Operations: Transpositions, Matrix by Matrix Multiplications, Matrix by Vector multiplication.

UNIT IV 13 Periods

Graph Theory: Computing the Connectivity Matrix, Finding Connected Components, All Pairs Shortest Paths, Computing Minimum Spanning Trees.

Applications: Job Sequencing with Deadlines, Knapsack Problem.

Learning Resources:

Text Book:

1. Selim G. Akl, The Design and Analysis of Parallel Algorithms, Prentice Hall, New Jersey, 1989.

Reference Books:

1. Michael J. Quinn, Parallel Computing: Theory & Practice, Tata McGraw Hill Edition, 2003.
2. Justin R. Smith, the Design and Analysis of Parallel Algorithms, Oxford University Press, USA, 1993.
3. Joseph JaJa, Introduction to Parallel Algorithms, Addison-Wesley, 1992.

CSEL16	.NET Technologies	L	T	P	C
		3	0	0	3

Course Objectives:

1. Comprehend the C# language and the .NET Framework.
2. Demonstrate the use of Windows Forms applications with rich, highly responsive user interfaces.
3. Identify the cloud web applications and Services using ASP.NET.
4. Relate the use of Language Integrated Query (LINQ).

Course Outcomes:

After successful completion of the course, the students are able to:

1. Apply the fundamental concepts of C# programming.
2. Implement advanced OOPS concepts in console applications.
3. Develop and deploy cloud web applications and web services using ASP.NET and AZURE API.
4. Develop database driven applications utilizing XML and LINQ.

Course Content:

UNIT I 12 Periods

Introducing C#, Writing a C# Program, Variables and Expressions.

Flow Control, More About Variables, Functions.

UNIT II 12 Periods

Debugging and Error Handling, Introduction to Object-Oriented Programming, Defining Classes, Defining Class Members.

Collections, Comparisons and Conversions.

UNIT III 14 Periods

Generics, Additional C# Techniques, Basic Desktop Programming.

Advanced Desktop Programming.

Advanced Cloud Programming

UNIT IV 12 Periods

Files, XML and JSON, LINQ, DATABASES

Learning Resources:

Text Book:

1. Karli Watson, Christian Nagel, Jacob Hammer Pedersen, Jon Reid, and Morgan Skinner, BEGINNING VISUAL C# 2015, Wiley Publishing, Inc**.**

Reference Books:

1. Stephen C. Perry, Core C# and .NET, Pearson Education, 2006.
2. Herbert Scheldt, C#: The Complete Reference, TATA McGraw Hill Publishing.
3. Andrew Troelsen, Pro C# and the .NET Platform, A! Press.
4. Kevin Hoffman, Microsoft Visual C# 2005 Unleashed, Sams Pearson India.

Web References:

1. https://en.wikipedia.org/wiki/.NET_Framework
2. www.dotnetjalps.com/.../Dynamic-URL-of-asp-net-web-service

CSEL17	Sematic Web	L	T	P	C
		3	0	0	3

Course Objectives:

1. Knowledge on concepts related to Web Intelligence and Semantic web.
2. Analyze the Knowledge Representation for the Semantic Web.
3. Describe the Ontology Engineering practices and Principles in Web Domain.
4. Interpret Social Network Analysis and semantic web.
5. Realize the Semantic Web Applications, Services and Technology.

Course Outcomes:

1. Differentiate the traditional and semantic web.
2. Explain the role of ontology in the semantic web, and concepts of ontology engineering.
3. Discuss the concepts of inference engines, semantic web applications and services.
4. Apply the concepts of semantic web in building various semantic web applications

Course Content:

UNIT I 12 Periods

Thinking and Intelligent Web Applications, The Information Age, The WorldWide Web, Limitations of Today's Web, The Next Generation Web.
Machine Intelligence, Artificial Intelligence, Ontology, Inference engines,Software Agents, Berners-Lee www, Semantic Road Map, Logic on thesemantic Web.

UNIT II 12 Periods

Ontologies and their role in the semantic web, Ontologies Languages forthe Semantic Web – Resource Description Framework(RDF) / RDF Schema,Ontology Web Language(OWL),UML,XML/XML Schema.

Ontology Engineering, Constructing Ontology, Ontology Development Tools,Ontology Methods, Ontology Sharing and Merging, Ontology Libraries andOntology Mapping.

UNIT III 12 Periods

Logic, Rule and Inference Engines. Semantic Web applications and services,Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base.

UNIT IV 12 Periods

XML Based Web Services, Creating an OWL-S Ontology for Web Services,Semantic Search Technology, Web Search Agents and Semantic Methods.

Case Study: Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features.

Learning Resources:

Text Books:

1. Thinking on the Web - Berners Lee, Godel and Turing, Wileyinterscience,2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer,2007.

Reference Books:

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J.Davies, Rudi Studer, Paul Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
3. Information Sharing on the semantic Web - HeinerStuckenschmidt; Frank Van Harmelen, Springer Publications.
4. Programming the Semantic Web, T.Segaran, C.Evans, J.Taylor,O'Reilly, SPD.

CSEL18	Wireless Networks	L	T	P	C
		3	0	0	3

Course Objectives:

1. To study about Simplified Reference model, MAC Control and applications in Mobile Communications.
2. To Know about the predominant communication systems in wireless domain.
3. To understand wireless LAN technologies.
4. To learn about the protocols used in Wireless Networks.

Course Outcomes: After successful completion of the course, the students are able to:

1. Discuss the wireless transmission technologies and media access control mechanisms.
2. Explain various 2G, 3G technologies and broadcast communication systems.
3. Describe the mobile IP and wireless LAN protocols.
4. Discuss the mobile transport layer protocols and wireless application protocols.

Course Content:

UNIT I 12 Periods

Introduction – Applications, A Short History of Wireless Communications, A Market for Mobile Communications, A Simplified Reference Model.
Wireless Transmission – Frequencies,Signals, Antennas, Signal Propagation, Multiplexing, Modulation, Spread Spectrum.
Medium Access Control - Motivation for a Specialized MAC, SDMA, FDMA, TDMA,CDMA, Comparison.

UNIT II 12 Periods

Telecommunication Systems: GSM, UMTS and IMT-2000.
Satellite Systems – History, Applications, Basics (GEO, LEO, MEO), Routing, Localization, Handover.
Broadcast Systems – Overview, Cyclic Repetition of Data, Digital Audio Broadcasting – Digital Video Broadcasting.

UNIT III 12 Periods

Wireless LAN – Infrared Vs. Radio Transmission – Infrastructure and Ad Hoc Networks – IEEE, 802.11– Bluetooth.
Mobile Network Layer –Mobile IP – Dynamic Host Configuration – Ad Hoc Networks.

UNIT IV 12 Periods

Mobile Transport Layer – Traditional TCP – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit / Fast Recovery – Transmission / Time-Out Freezing – Selective Retransmission – Transaction Oriented TCP.
Wireless Application Protocol – Architecture – Wireless Datagram Protocol – Wireless Transport Layer Security – Wireless Transaction Protocol – Wireless Session protocol – Wireless Application Environment – Wireless Markup Language – WML Script – Wireless Telephony Application – Example Stacks with WAP.

Learning Resources:

Text Book:

1. J.Schiller, "Mobile communications", 2nd edition, 2003, Pearson.

Reference Books:

1. William Stallings, "Wireless Communication Networks", 2nd edition, 2005, Pearson.
2. UWE Hansmann, LotherMerk, Martin S.Nicklous, Thomas Stober, "Principles of Mobile Computing", 2nd Edition.

Web References:

1. http://www.wireshark.org/ % Wireshark Packet Analyzer
2. http://www.cisco.com/en/US/docs/wireless/antenna/installation/guide/ant2506.html#wp44332 % Air-Ant 2506 Omni Directional Antenna
3. http://www.cisco.com/en/US/docs/wireless/antenna/installation/guide/ant2460.html#wp43294 % Air-Ant2460P-R Patch Antenna
4. http://www.cisco.com/en/US/docs/wireless/antenna/installation/guide/ant545r.html#wp43294 % Air-Ant5145V-R Omnidirectional Antenna
5. http://getitnew.com/air-lap1242ag-a-k9ciscoaironet1242agwirelessaccesspoint.aspx
6. % AIR-AP 1242AG-A-K9 Wi-Fi Access Point ,.
7. http://www.wlanmall.com/aironet-1131-80211ag-lwapp-access-point-integrated-antennas-cnfg-p-509.html % AIR-LAP1131AG-A-K9 Wi-Fi Lightweight Access Point
8. http://grouper.ieee.org/groups/802/11/Reports/802.11_Timelines.htm % IEEE 802.11 Working Group Timeline
9. http://www.etsi.org/WebSite/homepage.aspx % European Telecommunications Standard Institute (ETSI)

CSEL19	Cloud Computing	L	T	P	C
		3	0	0	3

Course Objectives: At the end of the course student will be able to understand:

1. Different Cloud Deploy Models & Service Models in enterprise cloud environment.
2. Cloud Virtual Machines Migration and cloud enhancing service.
3. Cloud Data security issues, work flow engines and SLA management for clouds.

Course Outcomes: After successful completion of the course, the students are able to:

1. Analyze the Integrate Enterprise cloud Environments, Cloud Deployment & Service Models.
2. Determine the use of Cloud Virtual Machines and cloud enhancing service.
3. Evaluate the Secure Distributed Data Storage and work flow engines for clouds.
4. Describe the Data security and SLA Management.

Course Content:

UNIT I 14 Periods

Introduction to cloud computing: Cloud Computing in a Nutshell, roots of Cloud Computing, Layers and Types of Clouds, Desired Features of Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers.

Migration into a Cloud: Introduction, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud.

Enriching the 'Integration as a Service' Paradigm for the Cloud Era: An Introduction, The Onset of Knowledge Era, The Evolution of SaaS, The challenges of SaaS paradigm, New integration scenarios, The integration methodologies, Saas integration products and platforms, SaaS Integration Services, Business to Business Integration(B2Bi) Services, A Framework of Sensor-Cloud Integration.

UNIT II 12 Periods

The Enterprise Cloud Computing Paradigm: Relevant deployment models for enterprise cloud computing, Issues for Enterprise Applications on the Cloud, Transition Challenges, Business Drivers toward a Marketplace for Enterprise Cloud Computing, The Cloud Supply Chain.

Virtual Machines Provisioning and Migration Services: Virtualization Technology overview, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VM Provisioning and Migration in Action, Provisioning in the Cloud Context.

Enhancing Cloud Computing Environments Using a Cluster as a Service: Introduction, Related Work, RVWS Design, Cluster as a Service: The Logical Design, Proof of Concept.

UNIT III 12 Periods

Secure Distributed Data Storage in Cloud Computing: Introduction, Cloud Storage: from LANs TO WANs, Technologies for Data Security in Cloud Computing Open Questions and Challenges.

Workflow Engine for Clouds: Introduction, Workflow Management Systems and Clouds, Architecture of Workflow Management Systems, Utilizing Clouds for Workflow Execution.

UNIT IV 12 Periods

SLA Management in Cloud Computing: Traditional Approaches to SLO Management, Types of SLA, Life Cycle of SLA, SLA Management in Cloud, Automated Policy-based Management.

Data Security in the Cloud: An Introduction to the Idea of Data Security , The Current State of Data Security in the Cloud, Homo Sapiens and Digital Information, Cloud Computing and Data Security Risk, Cloud Computing and Identity, The Cloud, Digital Identity, and Data Security, Content Level Security—Pros and Cons.

Learning Resources:

Text Book:

1. RajkumarBuyya, James Broberg, AndrZejGoscinski**,** Cloud Computing Principles and Paradigms, Wiley Publications.

Reference Books:

1. Michael Miller, Cloud Computing – Web-Based Application That Change the Way You Work and Collaborate Online, Pearson Publications.
2. Thomas Erl, ZaighamMahmood, & Ricardo Puttini, Cloud Computing**-** Concepts, Technology& Architecture Pearson Publications.
3. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010.
4. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010.
5. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, R.
6. Kai Hwang, Geoffrey C.Fox. Jack J. Dongarra, Distributed and Cloud Computing **–** From Parallel Processing to the Internet of Things, ELSEVIER Publications.

Web Resources:

1. Cloud computing course by Prof. Soumya K. Ghosh is available@ https://nptel.ac.in/courses/106105167/
2 Cloud computing and Distributed Systems course by Dr. Rajiv Misra is available @ https://nptel.ac.in/courses/106104182/
3. https://technet.microsoft.com/en-us/magazine/hh509051.aspx

CSEL20	Quantum Computing	L	T	P	C
		3	0	0	3

Course Objectives:

1. understand the basics of Quantum Computing.
2. familiarize the concepts of Quantum gates.
3. explore the applications of Quantum Computing.
4. understand the importance of Shor's algorithm & Grover's algorithm.
5. conceptualize the physical realization of Quantum computers.

Course Outcomes: After successful completion of the course, the students are able to:

1. Analyze the vital applications using Quantum computing principles and Practices.
2. Design simple circuits using Quantum gates.
3. Apply Shor's and Grover's algorithm in Quantum computing.
4. Relate the Quantum computing applications to the software.

Course Content:

UNIT I 12 Periods

Introduction – From Bits to Qubits – Power of Quantum Computing – How Quantum Physics Differs from – Obstacles and Research – Future Outlook.
Qubits, Quantum Mechanics and Computer Science Perspectives

UNIT- II 12 Periods

Quantum Gates – Single & Multiple Qubit Gates – Matrix Representation of Quantum Gates and Circuits – Bell States – Quantum Measurement – Quantum Half-Adder and Subtractor.

Applications of Quantum Computing – Quantum Teleportion – Parallelism – Superdense Coding – Quantum Communication.

UNIT III 14 Periods

Shor's Algorithm and Quantum Fourier Transform

Grover's Algorithm (Quantum Search Algorithms)

UNIT IV 12 Periods

Physical Realization of Quantum Computers

Quantum Computing Software

Learning Resources:

Text Book:

1. Vishal Sahni. "Quantum Computing", TMH, 2007.

Reference Books:

1. Dan C. Marinescu, Gabriela M. Marinescu, "Approaching Quantum Computing" Prentice Hall, 2004.
2. Mika Hirvensalo "Quantum Computing" ,2nd Edition, Springer,2004
3. Giuliano Beneti, Giulio Casati, GuilianoStrini "Principles of Quantum Computation and Information" Vol.1 Basic Concepts, World Scientific Publishing Company; New Ed edition (October 2004)

CSEL21	Natural Language Processing	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand the underlying concepts and techniques required f or natural language processing.
2. To create computational models for enabling effective and natural language processing.

Course Outcomes:

1. Ability to determine the structural components of sentences for a given Grammar.
2. Ability to produce logical form that represents context-independent meaning of a sentence.
3. Ability to link logical forms with syntactic structures for semantic interpretation of the sentence.
4. Ability to understand the ambiguity in natural language constructs and identify possible interpretations of a sentence.
5. Ability to map the logical form to the Knowledge representation to generate contextual representation.
6. Ability to understand the applications of natural language processing.

Course Content:

UNIT I 12 Periods

Introduction to Natural Language Understanding: Applications of Natural Language Understanding, Evaluating language Understanding Systems, The Different levels of Language Analysis.
Syntactic Processing: Grammars and Parsing, Grammars and Sentence Structure, Top- down parser, Bottom up chart parser, Transition network grammars, Top-down chart parsing, Finite state models and Morphological processing.

Features and Augmented Grammars: Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, A Simple Grammar Using Features, Parsing with Features, Augmented Transition Networks.

UNIT II 12 Periods

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling Questions in Context-Free Grammars.

Toward Efficient Parsing: Human preferences in parsing, Encoding Uncertainty-Shift-Reduce Parsers, A Deterministic Parser.

Ambiguity Resolution: Statistical Methods: Part of Speech tagging, Obtaining lexical probabilities, Probabilistic Context-Free Grammars, Best-First Parsing.

Semantic Interpretation:Semantics and logical Form: Semantics and Logical Form, Word Senses and Ambiguity, The Basic Logical Form Language, Encoding Ambiguity in the Logical Form,Verbs and States in Logical Form.

UNIT III 12 Periods

Linking Syntax and Semantics: Semantic Interpretation and Compositionality, A Simple grammar and Lexicon with Semantic Interpretation, Prepositional Phrases and Verb Phrases.

Ambiguity Resolution: Selectional Restrictions, Semantic Filtering Using Selectional Restrictions, Statistical Word Sense Disambiguation.
Context and World Knowledge:

Knowledge Representation and Reasoning: Knowledge representation, A Representation based on FOPC, Frames: representing Stereotypical Information, Handling Natural Language Quantification.

UNIT IV 12 Periods

Local discourse context and Reference: Defining Local Discourse Context and Discourse Entities, A Simple Model of Anaphora Based on History Lists, pronouns and Centering, Define Descriptions.

Using World Knowledge: Using world knowledge: Establishing Coherence, Matching against Expectations, Reference and Matching Expectations, Using Knowledge about Action and Casualty, Scripts: Understanding Stereotypical Situations

Discourse Structure: The Need for Discourse Structure, Segmentation and Cue Phrases, Discourse Structure and Reference, Relating Discourse Structure and Inference, Discourse Structure, Tense and Aspect, Managing the Attentional stack

Learning Resources:

Text Book:

1. James Allen, Natural Language Understanding, Second Edition, Pearson Education.

Reference Books:

1. Daniel Jurafsky, James H.Martin, Speech and Language Processing.
2. Christopher Manning, HinrichSchutze, Foundations of Statistical Natural Language Processing, MIT Press.
3. Elaine Rich and Kevin Knight, Artificial Intelligence, Second Edition, Tata McGraw Hill.

CSEL22	Virtual Reality	L	T	P	C
		3	0	0	3

Course Objectives:

1. Recognize the basic components of Virtual Reality technology.
2. Acquire Knowledge on Computing Architecture and Modeling concepts of Virtual Reality.
3. Distinguish the factors that influence the system performance in virtual reality.
4. Relatethe Virtual Realty Applications in various domains.

Course Outcomes: After successful completion of the course, the students are able to :

1. Distinguish the fundamental technologies and equipment used in virtual reality;
2. Investigate the theoretical contexts relevant to computing and modeling features in VR development.
3. Analyze the current generation systems for creating VR environments.
4. Identify the current VR technologies and next generation applications across all fields.

Course Content:

UNIT I 12 Periods

Introduction: The Three I's Virtual Reality, A short History of Early Virtual Reality, Early commercial VR Technology, VR Becomes an Industry, The five classic Components of a VR system.

Input Devices: Trackers, Navigation and Gesture Interfaces: Three- Dimensional Position Trackers, Navigation and Manipulation Interfaces, Gesture Interfaces.

Output Devices: Graphics, Three-Dimensional Sound and Haptic Displays: Graphics Displays Sound Displays, Haptic Feedback.

UNIT II 14 Periods

Computing Architectures for VR: The Rendering Pipeline Rendering, PC Graphics Architecture Workstation-Based Architectures, Distributed VR Architectures.

Modeling: Geometric modeling, Kinematics Modeling, Physical Modeling, Behavior Modeling, Model Management.

UNIT III 12 Periods

VR Programming: Toolkits and Scene Graphs, WorldToolkit, JAVA3D, General Haptics Open Software Toolkit,, People shop.

Human Factors in VR: Methodology and Terminology, User Performance Studies, VR Health and Safety Issues, VR and Society.

UNIT IV 12 Periods

Traditional VR Applications: Medical Applications of VR, Education, Arts and Entertainment, Military VR Applications
Emerging Applications of VR : VR Applications in Manufacturing, Applications of VR in Robotics, Information Visualization.

Learning Resources:

Text Book:
1. GrigoreC.Burdea, Philippe Coiffet. "Virtual Reality" Second Edition, Wiley India.

CSEL23	Cyber Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To introduce the fundamental Information security concepts & Threats.
2. Learn the security standards and policies to be maintained by the organizations.
3. Describe various Security Performance Metrics & Configuration reviews.
4. Discuss the different log management and backup procedures.
5. Use the Vulnerability analysis tools and perform auditing.

Course Outcomes:

1. Analyze the Information Security Assets and Threats.
2. Identify the various security standards and policies to be maintained by the organizations.
3. Design and Implement Security Performance Metrics, Configuration reviews, log management.
4. Apply the backup procedures, and Security Audit process using Vulnerability analysis tools.

Course Content:

UNIT I 13 Periods

Information Security Assets & Threats: Introduction, Role of a security analyst, Threats, Virus, Worms, Trojans, Other Threats, types of Network Attacks, types of Phishing Attack, Types of viruses, Types of worms, types of Trojans. DoS (denial-of-service) attack, Common Vulnerabilities and Exposures (CVE), Bluetooth related attacks.

Fundamentals of Information Security: Elements of information security, Principles and concepts - data security, Types of controls, Discretionary Access Control (DAC), Role-Based Access Control (RBAC).

UNIT II 13 Periods

Roles and Responsibilities: Information and Data Security Team, CEO or Executive Management, Security Engineer, Systems Administrator, Security Steering Committee, Security Incident Response Team.

Data Leakage: Introduction – Data Leakage, Organizational Data Classification, Location and Pathways, Content Awareness, Content Analysis Techniques, Data Protection, DLP Limitations, DRM-DLP Conundrum,Case studies: SQL Injection using OWASP tool.

Information Security Policies, Procedures, Standards and Guidelines: Information Security Policies, Key Elements of a Security Policy, Security Policy implementation, Security Standards, COSO, COBIT,ISO27001,SANS.

UNIT III 12 Periods

Information Security Performance Metrics: Introduction –Security Metrics, Types of Security Metrics, Using Security Metrics, Developing the Metrics Process, Metrics and Reporting.

Configuration review: Configuration Management, Organizational SecCM Policy, Identify CM Tools, Implementing Secure Configurations, case studies.

Log Correlation and Management: Event Log Concepts, Log Management Infrastructure and functions, Log Management - Using Log watch.

UNIT IV 12 Periods

Data Backup: Types of Backup, Backup Procedures, Types of Storage, Features of a Good Backup Strategy.

Information Security Audit: Information Systems Audit versus Information Security Audit, What is an Information Security Audit, Scope of the Audit, Types of Security Audits, Phases of Information Security Audit, Information Security Audit Methodology, Role of an Auditor, Penetration testing stages.

Vulnerability Analysis: What Is Vulnerability Assessment, Vulnerability Classification, Types of Vulnerability Assessment, Vulnerability Analysis Tools, Case studies.

Learning Resources:

Text Book : NASSCOM Handbook Study Material

Reference Books:

1. Nina Godbole, "Information System Security", Wiley
2. Bothra Harsh, "Hacking", Khanna Publishing House, Delhi.
3. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
4. MarttiLehto, PekkaNeittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015
5. Nelson Phillips and EnfingerSteuart, —Computer Forensics and Investigations‖, Cengage Learning, New Delhi, 2009.

CSEL24	Block Chain Technology	L	T	P	C
		3	0	0	3

Course Objectives: The student should be made to

1. Develop familiarity of current technologies, tools.
2. Impart strong technical understanding of Block Chain technologies.
3. Explore the Smart Contracts and Etherum implementation strategies
4. Introduce the current scenario and practical application areas of Hyper ledger.

Course Outcomes:After successful completion of the course, the students are able to :

1. Discuss the block chain technology in decentralized paradigm.
2. Explore cryptography and trading Applications along with their implementation strategies.
3. Discuss the implementation of smart contract and Etherum platform.
4. Explain the importance and applications of Hyper ledger.

Course Content:

UNIT I 15 Periods

BLOCKCHAIN 101- Distributed Systems, History of blockchain, Introduction to blockchain, Types of block chain, CAP theorem and blockchain, benefits and limitations of blockchain,

DECENTRALIZATION-Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full eco system decentralization, Smart contract, Decentralized Organizations, Decentralized autonomous organizations, Decentralized autonomous corporations, Decentralized autonomous societies, Decentralized applications, Platforms for Decentralization.

UNIT II 15 Periods

Cryptography And Technical Foundations- Introduction, Cryptographic primitives, Asymmetric Cryptography, Public and Private-keys, Financial -market and trading, Summary.
BITCOIN- Bitcoin, Transactions, Blockchain, Bitcoin Payments.

UNIT III 15 Periods

SMART CONTRACTS-History, Definition, RecardianContracts,.
ETHEREUM 101-Introduction, Ethereumblockchain, Elements of the Ethereumblockchain, Precompiled contracts, Accounts, Block, Ether, Messages, Mining, Clients and Wallets, Trading and investment, The Yellow paper, The Ethereum Network, Applications developed on Ethereum, Scalability and security issues, .

UNIT IV 15 Periods

HYPER LEDGER- Projects, Hyperledger as a Protocol, Fabric, Hyperledger Fabric, Sawtooth lake, Corda,
ALTERNATIVE BLOCKCHAIN- Block chains, Platforms.
SCALABILITY AND OTHER CHALLENGES- Scalability, Privacy, Security,

Learning Resources:
Text Book:

1. SeberriusJeffery,"Block Chain" 2nd Edition Publishers details 2015

CSEL25	Multi Core Technologies	L	T	P	C
		3	0	0	3

Course Objectives: The student should be made to:

1. Recognize the need for a parallel Computing paradigm in the Software.
2. Identify performance related parameters in the area of Computer architecture.
3. Comprehend the challenges in parallel and multi-threaded programming.
4. Acquire knowledge on various parallel programming paradigms, and solutions.

Course Outcomes: At the end of the course, the student should be able to:

1. Explain different multi-core architectures.
2. Identify the limitations of the ILP and the need for multi-core architectures.
3. Discuss the concepts of multi-threading and OPENMP.
4. Identify the issues related to multiprocessing and suggest solutions.

Course Content:

UNIT I 15 Periods

Introduction to Multi-Core Architecture, Motivation for concurrency in Software, Parallel Computing Platforms, Parallel Computing in Multiprocessors, Differentiating Multi-Core Architectures From Hyper-Threading Technology, Multi-Threading on Single-Core Versus Multi-Core Platforms, Understanding Performance, Amdahl' Law, Growing Returns: Gustafson's Law.
System Overview of Threading.

Defining Threads, System View of Threads, Threading above the Operating System, Threads Insidethe OS, Threads Inside the Hardware, What Happens When a Thread is Created, Application Programming Models and Threading, Virtual Environment:VMs and Platforms, Runtime Virtualization, System Virtualization.

UNIT II 15 Periods

Fundamental Concepts of Parallel Programming Designing for Threads, Task decomposition, Data Decomposition, Data Flow Decomposition, Implication of Different Decomposition, Implications of Different Decompositions, Challenges You'll Face, Parallel Programming Patterns, A motivating Problem: Error Diffusion, Analysis of the Error Diffusion Algorithm, An alternate Approach: Parallel Error Diffusion, Other Alternatives.

Threading And Parallel Programming Constructs Synchronization, Critical Sections, Deadlock, Synchronization Primitives, Semaphores, Locks, Condition Variables, Messages, Flow Control-Based Concepts, Fence, Barrier, Implementation-Dependent Threading Features.

UNIT III 15 Periods

Threading APIs: Threading APIs For Microsoft Windows,Win32/MFC Thread APIs, Threading APIs For Microsoft .NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread synchronization, POSIX Threads, Creating Threads, Mapping Threads, Thread Synchronization, Signaling, Compilation And Linking.

Open MP: A Portable Solution for Threading Challenges in Threading A Loop, Loop-Carried dependence, Data-race Conditions, Managing Shared And Private Data, Loop Scheduling And Portioning, Effective Use of Reductions, Minimizing Threading Overhead, Work-Sharing Sections, Performance-Oriented Programming, Using Barrier And No Wait, Interleaving single-Thread and

Multi-Thread Execution ,Data Copy-In And Copy-Out, Protecting Updates of Shared Variables, Intel Task Queuing Extension to Openmp, Openmp Library Functions, Openmp Environment Variables, Compilation, Debugging Performance.

UNIT IV 15 Periods

Solutions to Common Parallel Programming Problems: Too many threads, Data Races, Deadlocks And Live Locks, Deadlock, Heavily Contended Locks, Priority Inversion, Solutions For Heavily Contended Locks, Non-Blocking Algorithms, ABA Problem, Cache Line Ping-Ponging ,Memory Reclamation Problem, Recommendations , Thread-Safe functions and Libraries, Memory Issues, Bandwidth ,Working In the Cache, Memory Contention, Cache-Related issues, False Sharing, Memory consistency, Current IA-32 Architecture, Itanium Architecture, High-Level Languages, Avoiding Pipeline Stalls on IA-32 , Data Organization For High Performance.

Learning Resources:

Text Book:

1. Shameem Akhter and Jason Roberts, Multi-core Programming: Increasing Performance through software Multi-Threading, Intel Press, 2006.

Reference Books:

1. Peter S. Pacheco, An Introduction to Parallel Programming, Morgan-Kauffman/Elsevier, 2011.
2. Darryl Gove, Multi-core Application Programming for Windows, Linux, and Oracle Solaris, Pearson, 2011.
3. Michael J Quinn, Parallel programming in C with MPI and OpenMP, Tata McGraw Hill, 2003.

		L	T	P	C
CSEL26	***Industry Recommended Subject**	**3**	**0**	**0**	**3**

Open Electives for Other Branches

CODE NO.	SUBJECT NAME	CODE NO.	SUBJECT NAME
CSOL01	Programming with Java	CSOL02	RDBMS
CSOL03	Introduction to Python Programming	CSOL04	Internet Of Things

CSOL01	Programming with Java	L	T	P	C
		4	0	0	3

Course Objectives:

1. To understand the basic concepts and fundamentals of platform independent object oriented language.
2. To demonstrate skills in writing programs using exception handling techniques and multithreading.
3. To understand streams and efficient user interface design techniques.

Course Outcomes: After successful completion of the course, the students are able to

1. Use the syntax and semantics of java programming language and basic concepts of OOP.
2. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
3. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
4. Design event driven GUI and web related applications which mimic the real word scenarios.

Course Content:

UNIT I 12 Periods

Introduction: Introduction to java, java buzzword, data types, dynamic initialization, scope and life time, operators, control statements, arrays, type conversion and casting, finals & blank finals.
Classes and Objects: Concepts, methods, constructors, usage of static, access control, this key word, garbage collection, overloading, parameterpassing mechanisms, nested classes and inner classes.
Inheritance: Basic concepts, access specifiers, usage of super key word,method overriding, final methods and classes, abstract classes, dynamicmethod dispatch, Object class.

UNIT II 12 Periods

Interfaces: Differences between classes and interfaces, defining aninterface, implementing interface, variables in interface and extendinginterfaces.
Packages: Creating a Package, setting CLASSPATH, Access controlprotection, importing packages.
Exception Handling: Concepts of Exception handling, types ofexceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes.

UNIT III 12 Periods

Strings: Exploring the String class, String buffer class, Command-linearguments.
Library: Date class, Wrapper classes.
Multithreading: Concepts of Multithreading, differences betweenprocess and thread, thread life cycle, Thread class, Runnable interface,creating multiple threads, Synchronization, thread priorities, inter threadcommunication, daemon threads, deadlocks.
I/O Streams: Streams, Byte streams, Character streams, File class, Filestreams.

UNIT IV 12 periods

Applets: Concepts of Applets, life cycle of an applet, creating applets, passing parameters to applets, accessing remote applet, Color class and Graphics
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling events.
AWT: AWT Components, windows, canvas, panel, File Dialog boxes, Layout Managers, Event

handling model of AWT, Adapter classes, Menu, Menu bar.

Learning Resources:

Text Book:

1. Java The Complete Reference 9th Edition, Herbert Schildt, Mc Graw Hill Education (India) Private Limited, New Delhi.

Reference Books:

1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
2. Introduction to Java programming, By Y.DanielLiang,Pearson Publication.

CSOL02	Relational Database Management Systems(RDBMS) Open Elective	L	T	P	C
		4	0	0	3

Course Objectives:

1. To understand the fundamental concepts, historical perspectives, current trends, structures, operations and functions of different components of Databases.
2. To understand the types of integrity constraints in a relational database system and the concepts of SQL to create and access the database.
3. To understand basic concepts of ER model and database design using normalization process.
4. To understand transaction processing.

Course Outcomes: After successful completion of the course, the students are able to

1. Describe the basic concepts of database systems.
2. Explain various data models and database system architectures.
3. Write queries to access database using SQL.
4. Design a database using normalization theory and explain the concepts of transaction processing.

Course Content:

UNIT I 12 Periods

Databases and Database Users: Introduction - An Example - Characteristics of the Database Approach - Actors on the Scene - Workers behind the Scene - Advantages of Using the DBMS Approach.

Database System Concepts and Architecture: Data Models, Schemas, and Instances - Three-Schema Architecture and Data Independence - Database Languages and Interfaces - The Database System Environment - Centralized and Client/Server Architectures for DBMSs.

UNIT II 12 Periods

Data Modeling Using the Entity-Relationship (ER) Model: Using High- Level Conceptual Data Models for Database Design - An Example Database Application - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types.

The Relational Data Model and Relational Database Constraints: Relational Model Concepts - Relational Model Constraints and Relational Database Schemas - Update Operations, Transactions, and Dealing with Constraint Violations.

UNIT III 12 Periods

SQL-99: Schema Definition, Constraints, Queries, and Views: SQL Data Definition and Data Types - Specifying Constraints in SQL - Schema Change Statements in SQL - Basic Queries in SQL - More Complex SQL Queries - INSERT, DELETE, and UPDATE Statements in SQL - Views (Virtual Tables) in SQL.

UNIT IV 12 Periods

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas - Functional Dependencies - Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing - Transaction and System Concepts - Desirable Properties of Transactions - Characterizing Schedules Based on Recoverability -Characterizing Schedules Based on serializability.

Learning Resources:

Text Book:

1. Fundamentals of Database Systems, Ramez Elmasri and SHamKanth B.Navate Pearson Education, 5th edition.

Reference Books:

1. Introduction to Database Systems, C.J.Date Pearson Education.
2. Data Base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rdEdition.
3. Data base System Concepts, Abraham Silberschatz, Henry.F.Korth, McGraw hill, 5th edition.

CSOL03	Introduction to Python Programming Open Elective	L	T	P	C
		4	0	0	3

Course Objectives:

At the end of the course the students will understand

1. Basic concepts of Python.
2. Procedural programming features of python, Strings and Lists.
3. Object oriented programming in python, Tuple and Sets.
4. Dictionary processing and File handling.

Course Outcomes:

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

1. Develop simple programs in python.
2. Write modular programs using the concepts of Lists and Strings.
3. Apply Object oriented programming features of python.
4. Manipulate various mutable and immutable data types.
5. Write programs using dictionaries and files

Course Content:

UNIT I 15 Periods

Basics of Python Programming: Python Character set,Token, Python Core Data Type , The print() function, Assigning value to a variable, Multiple assignments,, Writing simple programs in Python, the input() Function, Python inbuiltFunctions: the ord and chr functions

Operators and Expressions: Introduction, Operators and Expressions, Arithmetic operators Operator precedence and Associativity, Changing Precedence and Associativity, Bit Wise operator, The compound Assignment operator.

Decision making statements: Introduction, Boolean operators Decision making statements, Conditional Expressions.

Loop Control Statements: The while,range,for,NestedLoops,The break statement,The continue statement

UNIT II 15 Periods

Functions: Introduction, Syntax and Basics of a Function, Use of a Function, parameters with Arguments in a Function The local and Global scope of a variable,The return Statement,RecursiveFunctions.

Strings: Introduction,thestrclass, Basic Inbuilt Python functions for String, the index[] Operator, Traversing a String, Immutable strings, String operators, String operations.

Lists & List Processing: Searching and Sorting;

UNIT III 15 Periods

Object Oriented Programming: Classes, objects and Inheritance, Introduction, DefiningClasses, Method Overloading, Inheritance.

Tuples and Sets:

Tuples, Creating Tuple() Function, inbuilt function for Tuples, Indexing and Slicing Operations in Tuples, passing Arguments and Variable length Arguments in Tuples Lists and Tuple, Traverse Tuples from a List, The zip() Function In inverse zip Function; More Programs in Tuples.

Sets: Creating Sets, The set in and not in operator, The python set classes, Set Operations

UNIT IV 15 Periods

Dictionaries: Need for Dictionaries, Basics of Dictionaries, Creating a Dictionary, Adding and Replacing Values,Retrieving values Formatting Dictionaries, Deleting Items, Comparing Two Dictionaries, The Methods of Dictionary Class, Traversing Dictionaries, Nested Dictionaries, Simple Programs in Dictionaries, and Polynomials as Dictionaries.

File Handling: Introduction, Need for File handling Text input and output, Theseek() Function, BinaryFiles, Accessing and manipulating Files and Directories in a Disk.

Learning Resources:

Text Book:

1. Programming and Problem Solving with Python - Ashok NamdevKamthane and Amit Ashok Kamthane ,Tata McGraw Hill,2018 Edition

Reference Books:

1. Beginning Python from novice to professional by Magnus Lie Hedland, 2nd Edition, Apress
2. Programming in Python 3 – A complete introduction to the Python Language by Mark Summerfield, Pearson.
3. Learning Python by Mark Lutz, 5th Edition, O'Reilly.
4. Programming Python by Mark Lutz, 4th Edition, O'Reilly.

CSOL04	Internet Of Things Open Elective	L	T	P	C
		4	0	0	3

Course Objectives:
1. To introduce the terminology, technology and applications of IoT.
2. To introduce the concept of M2M with necessary protocols.
3. To introduce the Raspberry PI platform.
4. To introduce the implementation of web based services on IoT devices.

Course Outcomes:
1. Applythe terminology and technologyof IoT toreal world applications.
2. Classify the protocols of Communication in IOT.
3. Develop IoT solutions using Raspberry PI platform.
4. Implement web based services on IoT devices.

Course Content:

UNIT I Text Book-1 9 Periods

Introduction: Internet of Things Promises–Definition– Scope–Sensors for IoT Applications–Structure of IoT– IoT Map Device
Seven Generations Of Iot Sensors To Appear: Industrial sensors – Description & Characteristics–First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics– Polytronics Systems – Description & Characteristics–Sensors' Swarm – Description & Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap

UNIT II Text Book-2 12 Periods

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

UNIT III Text Book-2 12 Periods

Python on the Pi : Hello, Python, A Bit More Python, Objects and Modules, Even More Modules, Launching Other Programs from Python, Troubleshooting Errors, Basic Input and Output - Using Inputs and Outputs.
Programming Inputs and Outputs with Python: Installing and Testing GPIO in Python, Blinking an LED, Reading a Button.

UNIT IV Text Book-2 12 Periods

PREPARING IOT PROJECTS: Creating the sensor project - Preparing Raspberry Pi - Clayster libraries - Hardware- Interacting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data - External representation of sensor values - Exporting sensor data - Creating the actuator projectHardware - Interfacing the hardware - Creating a controller - Representing sensor values - Parsing sensor data - Calculating control states - Creating a camera - Hardware -Accessing the serial port on Raspberry Pi - Interfacing the

hardware - Creating persistent default settings - Adding configurable properties - Persisting the settings - Working with the current settings - Initializing the camera

Learning Resources:

Text Books:

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024'.
2. ArshdeepBahga and Vijay Madisetti, Internet of Things A Hands-on Approach,Universities Press, 2015, ISBN: 9788173719547.

Reference Books:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors OvidiuVermesan
2. Peter Friess,'Internet of Things – From Research and Innovation to Market 4. Deployment', River Publishers, 2014 5. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

Web References:

1. http://postscapes.com/.
2. http://www.theinternetofthings.eu/what-is-the-internet-of-things.
3. https://www.youtube.com/channel/UCfY8sl5Q6VKndz0nLaGygPw.
4. https://www.codeproject.com/Learn/IoT/.