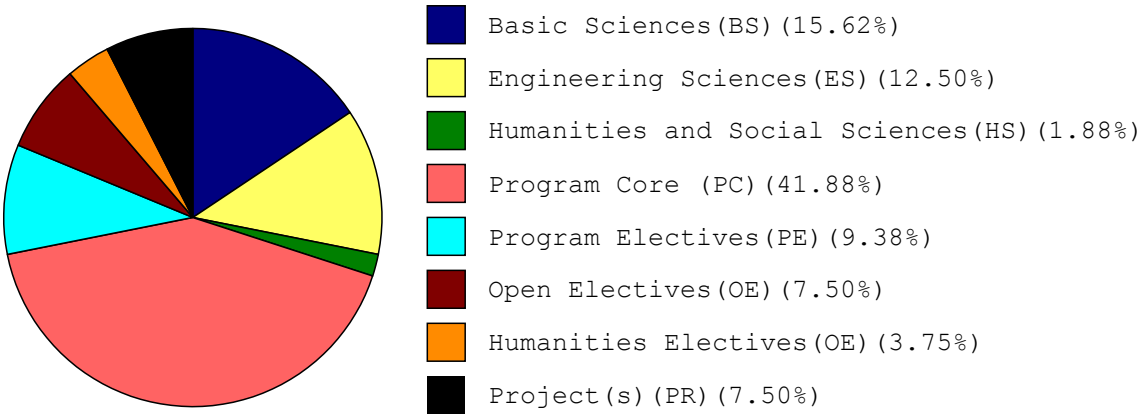
DEPARTMENT OF INFORMATION TCHNOLOGY

B.TECH. INFORMATION TCHNOLOGY

Program curriculum grouping based on course components

Course Component	Curriculum Content (% of total number of credits program)	Total number of contact hours	Total number of credits
Basic Sciences (BS)	15.63	28	25
Engineering Sciences (ES)	12.5	28	20
Humanities and Social Sciences (HS)	1.88	4	3
Professional Core (PC)	41.88	83	67
Professional Electives (PE)	9.38	15	15
Open Electives (OE)	7.5	12	12
Humanities Electives (HE)	3.75	6	6
Project(s) (PR)	7.5	24	12
Mandatory Course(s) (MC)	--	10	--
Total number of Credits			160



B.TECH. INFORMATION TCHNOLOGY

(w.e.f. the batch of students admitted from the academic year 2018-2019)

Three Weeks Orientation Programme is Mandatory before starting Semester I [First Year]

Semester I [First Year] COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	IT/CS 111	Mathematics-I	3	1	-	40	60	4	BS
2	IT/CS 112	Engineering Physics	3	1	-	40	60	4	BS
3	IT/CS/EC 113	Basic Electrical Engineering	3	1	-	40	60	4	ES
4	IT/CS 151	Physics Lab	-	-	3	40	60	1.5	BS
5	IT/CS/EC 152	Basic Electrical Engineering Lab	-	-	2	40	60	1	ES
6	IT/CH/CS/EC 153	Engineering Graphics & Design Lab	1	-	4	40	60	3	ES
7	MC 001	Constitution of India.	2	-	-	100	-	-	MC
		TOTAL	12	3	9	340	360	17.5	TPW-24

Semester II [First Year] COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	IT/CS 121	Mathematics-II	3	1	-	40	60	4	BS
2	IT/CE/CS 122	Engineering Chemistry	3	1	-	40	60	4	BS
3	IT/CE/CH/CS/ EE/EC/ME 123	Programing for Problem Solving	3	-	-	40	60	3	ES
4	IT/CH/CS/EC 124	English for Communication Skills	2	-	-	40	60	2	HS
5	IT/CE/CS 161	Chemistry Lab	-	-	3	40	60	1.5	BS
6	IT/CE/CH/CS/ EE/EC/ME 162	Programing for Problem Solving Lab	-	-	4	40	60	2	ES
7	IT/CH/CS/EC 163	Workshop Practice Lab	1	-	4	40	60	3	ES
8	IT/CH/CS/EC 164	English Language Communication Skills Lab	-	-	2	40	60	1	HS
9	MC 002	Environmental Science	2	-	-	100	-	-	MC
10	MC 003	Essence of Indian Traditional Knowledge	2	-	-	100	-	-	MC
		TOTAL	16	2	13	520	480	20.5	TPW-31

Semester III [Second Year] COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	IT/CS 211	Mathematics - III	3	1	-	40	60	4	BS
2	IT/CS 212	Life Science for Engineers	2	-	-	40	60	2	BS
3	IT/CS 213	Digital Electronics	3	-	-	40	60	3	ES
4	IT/CS 214	Discrete Mathematics	3	-	-	40	60	3	PC
5	IT/CS 215	Data Structures	3	-	-	40	60	3	PC
6	IT/CS 216	Object Oriented Programming	3	-	-	40	60	3	PC
7	IT/CS 251	Digital Electronics Lab	-	-	2	40	60	1	ES
8	IT/CS 252	Data Structures Lab	-	-	4	40	60	2	PC
9	IT/CS 253	Object Oriented Programming Lab	-	-	2	40	60	1	PC
10	MC 004	Design Thinking and Product Innovation	2	-	-	100	-	-	MC
		TOTAL	19	1	8	460	540	22	TPW-28

Semester IV [Second Year] — COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	IT/CS 221	Computer Organization	3	-	-	40	60	3	PC
2	IT/CS 222	Operating Systems	3	-	-	40	60	3	PC
3	IT/CS 223	Database Management Systems	3	-	-	40	60	3	PC
4	IT/CS 224	Formal Languages and Automata Theory	3	-	-	40	60	3	PC
5	IT/CS225	Humanities Elective - I	3	-	-	40	60	3	HE
6	IT/CS 226	Open Elective-I	3	-	-	40	60	3	OE
7	IT/CS 261	Operating Systems Lab	-	-	4	40	60	2	PC
8	IT/CS 262	Database Management Systems Lab	-	-	4	40	60	2	PC
9	MC003	Essence of Indian Traditional Knowledge	2	-	-	100	-	-	MC
		TOTAL	20	0	8	420	480	22	TPW-28

Semester V (Third Year) — COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	IT/CS 311	Computer Networks	3	-	-	40	60	3	PC
2	IT/CS 312	Design & Analysis of Algorithms	3	-	-	40	60	3	PC
3	IT/CS 313	Web Technologies	3	-	-	40	60	3	PC
4	IT/CS 314	Software Engineering	3	-	-	40	60	3	PC
5	IT/CS 315	Professional Elective-I	3	-	-	40	60	3	PE
6	IT/CS 316	Open Elective-II	3	-	-	40	60	3	OE
7	IT/CS 351	Design & Analysis of Algorithms Lab	-	-	4	40	60	2	PC
8	IT/CS 352	Web Technologies Lab	-	-	4	40	60	2	PC
9	IT/CS 353	Software Engineering Lab	-	-	4	40	60	2	PC
		TOTAL	18	0	12	360	540	24	TPW-30

Semester VI [Third Year] — COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination			Category
	Code No.	Subject Name	Periods per week			Maximum Marks		Credits	Code
			L	T	P	SES	EXT		
1	IT/CS 321	Compiler Design	3	-	-	40	60	3	PC
2	IT/CS 322	Data Engineering	3	-	-	40	60	3	PC
3	IT/CS 323	Artificial Intelligence	3	-	-	40	60	3	PC
4	IT/CS 324	Cryptography & Network Security	3	-	-	40	60	3	PC
5	IT/CS 325	Professional Elective-II	3	-	-	40	60	3	PE
6	IT/CS 326	Open Elective-III	3	-	-	40	60	3	OE
7	IT/CS 361	Artificial Intelligence Lab	-	-	4	40	60	2	PC
8	IT/CS 362	Project - I	-	-	4	40	60	1	PR
9	IT/CS 363	Term Paper	-	-	4	100	-	1	PR
		TOTAL	18	0	12	420	480	22	TPW-30

Semester VII [Fourth Year] COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination		Credits	Category Code
	Code No.	Subject Name	Periods per week			Maximum Marks			
			L	T	P	SES	EXT		
1	IT/CS 411	Machine Learning	3	-	-	40	60	3	PC
2	IT/CS 412	Neural Networks	3	-	-	40	60	3	PC
3	IT/CS 413	Professional Elective-III	3	-	-	40	60	3	PE
4	IT/CS 414	Professional Elective-IV	3	-	-	40	60	3	PE
5	IT/CS 415	Humanities Elective-II	3	-	-	40	60	3	HE
6	IT/CS 451	Machine Learning Lab	-	-	2	40	60	1	PC
7	IT/CS 452	Project - II	-	-	4	40	60	2	PR
8	IT/CS 453	Internship	-	-	-	100	-	2	PR
		TOTAL	15	0	6	380	420	20	TPW-21

Semester VIII [Fourth Year] COURSE STRUCTURE

SNo.	Course Details		Scheme of Instruction			Scheme of Examination		Credits	Category Code
	Code No.	Subject Name	Periods per week			Maximum Marks			
			L	T	P	SES	EXT		
1	IT/CS 421	Professional Elective-V (MOOCs)	3	-	-	-	100	3	PE
2	IT/CS 422	Open Elective-IV (MOOCs)	3	-	-	-	100	3	OE
3	IT/CS 461	Project - III	-	-	12	40	60	6	PR
		TOTAL	6	0	12	40	260	12	TPW-18

Program Elective Courses

Code No.	Subject Name	Code No.	Subject Name
ITEL01	UNIX Programming	ITEL02	Interactive Computer Graphics
ITEL03	Big Data Analytics	ITEL04	Embedded Systems
ITEL05	Open Source Systems	ITEL06	Digital Image Processing
ITEL07	Network Programming	ITEL08	Mobile App Development
ITEL09	Internet of Things	ITEL10	Object Oriented Analysis and Design
ITEL11	Distributed Computing	ITEL12	Principles of Programming Languages
ITEL13	* Industry Related Subject	ITEL14	Advanced Computer Architecture
ITEL15	Design and Analysis of Parallel Algorithms	ITEL16	.NET Technologies
ITEL17	Semantic Web	ITEL18	Wireless Networks
ITEL19	Cloud Computing	ITEL20	Quantum Computing
ITEL21	Natural Language Processing	ITEL22	Virtual Reality
ITEL23	Cyber Security	ITEL24	Block Chain Technology
ITEL25	Multicore Technologies	ITEL26	* Industry Related Subject

Value Added Courses

Code No.	Subject Name	Code No.	Subject Name
IT V01	English Competency Development Programme	IT V02	Introduction to Computing
IT V03	Spoken English & Etiquette	IT V04	Programming with Python

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

IT/CS 111	MATHEMATICS-I (Calculus & Linear Algebra) **Semester I [First Year]**	**L T P C Int Ext** **3 1 - 4 40 60**

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:

After successful completion of the course, the students are 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 Rolle'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.

UNIT I *Text Book - 1* [CO:1] **(15)**

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

UNIT II *Text Book - 1* [CO:2] **(15)**

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

UNIT III *Text Book - 2* [CO:3] **(15)**

Vectors : addition and scalar multiplication, Vector space, linear dependence and indepence of vectors. basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank nullity theorem (without proof), composition of linear maps, Matrix associated with a linear map.

UNIT IV *Text Book - 2* [CO:4] **(15)**

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

LEARNING RESOURCES:

TEXT BOOK(s):

1. B.S.Grewal - Higher Engineering Mathematics, Khanna publishers, 42nd edition, 2017.
2. V. Krishnamurthy, V.P. Mainra and J.L. Arora - An introduction to Linear Algebra, Affiliated East-West press, Reprint 2005.

REFERENCE BOOK(s):

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. Erwin Kreyszig - Advanced Engineering Mathematics, John Wiley & Sons, 2006.

WEB RESOURCES:

http://nptel.iitm.ac.in/courses/

IT/CS 112	ENGINEERING PHYSICS (Semiconductor Physics) **Semester I [First Year]**	**L T P C Int Ext** **3 1 - 4 40 60**

COURSE OBJECTIVES:

1. To Introduce the concept of electron motion in periodic potentials and classification of solids, band formation by learning the prerequisite quantum physics.
2. To understand the diode equation and formation of P-N junction from the basics of semiconductors.
3. To understand the interaction of radiation with bulk semiconductors and the relevant Optoelectronic devices with energy band diagrams.
4. To understand 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 students are able to

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.

UNIT I [CO:1] **(15)**

Introduction to Quantum mechanics : Wave nature of particles, de Broglie's hypothesis, Davisson and 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).

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

UNIT II [CO:2] **(15)**

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 [CO:3] **(15)**

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 Hetro structure lasers with band diagrams, characteristics of laser and LED. PIN diode, Solar cell , working principle and characteristics.

UNIT IV [CO:4] **(15)**

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 Van der Pauw measurements for carrier density, resistivity, and Hall mobility, Hot-point probe measurement, capacitance-voltage measurements, Parameter extraction from Diode I-V characterstics.

LEARNING RESOURCES:

TEXT BOOK:

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

REFERENCE BOOK(s):

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 RESOURCES:

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

IT/CS/EC 113 **BASIC ELECTRICAL ENGINEERING** **L T P C Int Ext**

3 1 - 4 40 60

Semester I [First Year]

COURSE OBJECTIVES:

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:

After successful completion of the course, the students are 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.

UNIT I [CO:1] **(15)**

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 [CO:2] **(15)**

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 [CO:3] **(15)**

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 [CO:4] **(15)**

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 BOOK(s):

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 BOOK(s):

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 RESOURCES:

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/

IT/CS 151	PHYSICS LAB	L T P C Int Ext
		- - 3 1.5 40 60

Semester I [First Year]

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:

After successful completion of the course, the students will be able to

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

List of 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 conductivityr.
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 , R.V.R. & J.C. CE, 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.

IT/CS/EC 152	BASIC ELECTRICAL ENGINEERING LAB	L T P C Int Ext
		- - 2 1 40 60

Semester I [First Year]

COURSE OBJECTIVES:

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:

After successful completion of the course, the students 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 Exercises / Activities:

1. Familiarisation 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 â€“ 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) and single-phase induction machine.
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.

IT/CH/CS/EC 153	ENGINEERING GRAPHICS & DESIGN LAB	L T P C Int Ext 1 - 4 3 40 60

Semester I [First Year]

COURSE OBJECTIVES:

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:

After successful completion of the course, the students are 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.

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

UNIT I

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:

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

REFERENCE BOOK(s):

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

IT/CS 121	MATHEMATICS-II	L T P C Int Ext
	(Multivariable Calculus and Ordinary Differential Equations)	3 1 - 4 40 60

Semester II [First Year]

COURSE OBJECTIVES:

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:

After successful completion of the course, the students are 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.

UNIT I [CO:1] **(15)**

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

UNIT II [CO:2] **(15)**

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 [CO:3] **(15)**

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 [CO:4] **(15)**

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, Bessel functions of the first kind and their properties

LEARNING RESOURCES:

TEXT BOOK:

B.S.Grewal - Higher Engineering Mathematics, Khanna publishers, 42nd edition, 2017.

REFERENCE BOOK(s):

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
2. Erwin Kreyszig - Advanced Engineering Mathematics, John Wiley & Sons, 2006.

WEB RESOURCES:

http://nptel.iitm.ac.in/courses/

IT/CE/CS 122 **ENGINEERING CHEMISTRY** **L T P C Int Ext**
3 1 - 4 40 60

Semester II [First Year]

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

1. Student can identify stable complexes and suitable electrochemical energy systems for end usage.
2. apply his knowledge for effective water treatment and corrosion prevention.
3. 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..

UNIT I [CO:1] **(15)**

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 [CO:2] **(15)**

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. Cathodic protection by sacrificial anodic method and impressed current method. Electroplating (Cu), Electrolessplating (Ni).

UNIT III [CO:3] **(15)**

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 [CO:4] **(15)**

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 BOOK(s):

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

REFERENCE BOOK(s):

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

WEB RESOURCES:

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.

IT/CE/CH/CS/ EE/EC/ME 123	PROGRAMING FOR PROBLEM SOLVING	L T P C Int Ext 3 - - 3 40 60

Semester II [First Year]

COURSE OBJECTIVES:

1. To understand 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:

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

1. develop algorithms and flow charts for simple problems.
2. use suitable control structures for developing code in C.
3. design modular programs using the concepts of functions and recursion.
4. Develop code for complex applications using structures, pointers and file handling features.

UNIT I [CO:1] **(12)**

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 [CO:2] **(11)**

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 [CO:3] **(11)**

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 [CO:4] **(11)**

Structures: 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:

Byron Gottfried - Programming with C (Schaum's Outlines), Third Edition, Tata McGraw-Hill.

REFERENCE BOOK(s):

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 RESOURCES:

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

IT/CH/CS/EC	ENGLISH FOR COMMUNICATION SKILLS	L T P C Int Ext
124		2 - - 2 40 60

Semester II [First Year]

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

After successful completion of the course, the students are 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.
4. improve clarity to locate and learn the required information.

UNIT I [CO:1] **(8)**

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 [CO:1,2,3] **(8)**

Writing Skills

2.1 - Proposal writing

2.2 - Letter-writing

2.3 - Techniques for writing precisely (precis writing)

2.4 - E-mail writing

UNIT III [CO:3] **(8)**

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 [CO:1,2,3,4] **(8)**

Nature and Style of Sensible Writing

4.1 - Description & Narration (Paragraph Writing). [CO:1,2,3]

- Essay Writing (Expository Essay). [CO:1,2,3]
- Note-Making and Note-Taking. [CO:1,2,4]
- Methods of preparing notes. [CO:1,2,4]

LEARNING RESOURCES:

TEXT BOOK:

Communication Skills. Sanjay Kumar and Pushpa Lata.Oxford University Press.

REFERENCE BOOK(s):

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. Practical English Usage.Michael Swan. OUP. 1995Press

IT/CE/CS 161	CHEMISTRY LAB	L T P C Int Ext
		- - 3 1.5 40 60

Semester II [First Year]

COURSE OBJECTIVES:

1. To learn the concepts of equivalent weight, molecular weight, normality, molarity, weight percent, 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 Fe2+ 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:

After successful completion of the course, the students will be able to

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 conductometrically.
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 I2 in water.
13. Determination of Rf value using TLC.
14. Verification of Freundlich isotherm using adsorption of acetic acid on activated charcoal.

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

IT/CE/CH/CS/ EE/EC/ME 162	PROGRAMING FOR PROBLEM SOLVING LAB	L T P C Int Ext - - 4 2 40 60

Semester II [First Year]

COURSE OBJECTIVES:

1. To understand 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:

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

1. develop algorithms and flow charts for simple problems.
2. use suitable control structures for developing code in C.
3. design modular programs using the concepts of functions and recursion.
4. Develop code for complex applications using structures, pointers and file handling features.

List of Exercises / Activities:

[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.

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

IT/CH/CS/EC 163 **WORKSHOP PRACTICE LAB** **L T P C Int Ext**

1 - 4 3 40 60

Semester II [First Year]

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 & equipments.

COURSE OUTCOMES:

After successful completion of the course, the students will be able to

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

Lectures and Videos: [10 hours]

1. Manufacturing Methods: 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 Lectures).
2. CNC machining and Additive manufacturing (1 Lecture).
3. Fitting operations and power tools (power hack saw, table mounted circular saw, wood turning lathe, bench grinder, concrete mixer, concrete vibrator etc.,) (1 Lecture).
4. Basic principles involved in electrical circuits and electronic PCB circuits(1 Lecture).
5. Carpentry (1 Lecture).
6. Welding(arc welding & gas welding) (1 Lecture).
7. Metal casting(1 Lecture).
8. Plastic moulding, glass cutting (1 Lecture).

Text book:

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.

Reference books:.

1. Kalpakjian S and Steven S.Schmid. - Manufacturing Engineering and Technology, 4th edition, Pearson Education, India, 2002.
2. Rao P.N. - Manufacturing Technology, Volume I &II, Tata McGrawHill House, 2017.

Work shop Practice: (60 hours)

Objectives:

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

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.

List of Exercises - Trade wise Experiments:

1. Welding shop(both arc &gas welding)
    - Square butt joint
    - Lap joint
    - Single v butt joint
    - Gas welding & Cutting
2. Fitting Shop& Casting
    - Inclined fit
    - Half round fit
    - V fit
    - Moulding and casting of Hand wheel
3. Practice on electrical wiring and Electronic circuit boards
    - One bulb controlled by one switch &one bulb controlled by two switches
    - Two bulbs controlled by one switch (Stair case connection)
    - Tube light connection
    - Measurement of resistance, voltage and current with the help of a multi-meter & soldering on an electronic PCB circuit.
4. Machine Shop
    - Practice of machining operations on Lathe, Milling, Shaping, Drilling and Slotting Machines.
5. Carpentry
    - Lap joint
    - Cross lap joint
    - Dovetail joint
    - Turning on wood turning Lathe
6. Tin Smithy
    - Rectangular tray
    - Funnel
    - Pipe joint
    - Rectangular Scoop

Plastic moulding and glass cutting

Note: A minimum of 2 (Two) from each trade - Total 12 (Twelve) experiments - have to be Performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

IT/CH/CS/EC 164	ENGLISH LANGUAGE COMMUNICATION SKILLS LAB	L T P C Int Ext - - 2 1 40 60

Semester II [First Year]

COURSE OBJECTIVES:

1. To 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.
2. To acquaint the students with the Standard English pronunciation, i.e., Receive Pronunciation (RP), with the knowledge of stress and intonation.
3. To develop production and process of language useful for social and professional life.
4. To develop in them communication and social graces necessary for functioning. Improve the dynamics of professional presentations.
5. To develop critical reading and comprehension skills at different levels.

COURSE OUTCOMES:

After successful completion of the course, the students 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. develop effective communication and presentation skills and using language effectively to face interviews with success.

List of Exercises / Activities:

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 BOOK(S) :

1. Communication Skills. Sanjay Kumar and Pushpa Lata. 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

IT/CS 211	MATHEMATICS - III	L T P C Int Ext
		3 1 - 4 40 60

Semester III [Second Year]

COURSE OBJECTIVES:

1. 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:

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

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.

UNIT I *Text Book - 1* [CO:1] **(10)**

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 *Text Book - 1* [CO:2] **(16)**

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 *Text Book - 1* [CO:3] **(14)**

Applied Statistics: 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 *Text Book - 1* [CO:4] **(14)**

Small and Large Sample tests: 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 independent

LEARNING RESOURCES:

TEXT BOOK:

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

REFERENCE BOOK(s):

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.

WEB RESOURCES:

1. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
2. S.C.Gupta and V.K.Kapoor., Fundamentals of Mathematical Statistics, Sultan Chand & Co.

IT/CS 212	LIFE SCIENCES FOR ENGINEERS	L T P C Int Ext
		2 - - 2 40 60

Semester III [Second Year]

COURSE OBJECTIVES:

At the end of the course, the student will understand

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

COURSE OUTCOMES:

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

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

UNIT I [CO:1] **(6)**

Living Organisms: Comparison of biological organisms with man made 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 [CO:2] **(6)**

Proteins and Enzymes: 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

UNIT III [CO:3] **(6)**

Cell Physiology: Bioenergetics, Respiration: Glycolysis and TCA cycle, Electron transport chain and oxidative phosphorylation.Mechanism of photosynthesis; Neurons, synaptic and neuromuscular junctions

UNIT IV [CO:4] **(10)**

Genes and genetic material (DNA and RNA): Mendel's laws, gene mapping, Mitosis and Meiosis, single gene disorders in humans, Genetic code, DNA replication, Transcription, TranslationRecombinant DNA Technology: recombinant vaccines, transgenic microbes, animalcloning, biosensors, biochips.

LEARNING RESOURCES:

TEXT BOOK(s):

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 BOOK(s):

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.

IT/CS 213	DIGITAL ELECTRONICS	L T P C Int Ext
		3 - - 3 40 60

Semester III [Second Year]

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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(14)**

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 *Text Book - 1* [CO:2] **(12)**

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 *Text Book - 1* [CO:3] **(12)**

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 *Text Book - 1* [CO:4] **(12)**

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:

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

REFERENCE BOOK(s):

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

IT/CS 214	DISCRETE MATHEMATICS	L T P C Int Ext
		3 - - 3 40 60

Semester III [Second Year]

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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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 *Text Book - 1* [CO:2] **(13)**

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 *Text Book - 1* [CO:3] **(12)**

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 *Text Book - 1* [CO:4] **(13)**

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:

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

REFERENCE BOOK(s):

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.

IT/CS 215	DATA STRUCTURES	L T P C Int Ext
		3 - - 3 40 60

Semester III [Second Year]

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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(14)**

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.

UNIT II *Text Book - 1* [CO:2] **(14)**

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 *Text Book - 1* [CO:3] **(16)**

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 *Text Book - 1* [CO:4] **(14)**

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 BOOK:

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

REFERENCE BOOK(s):

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mc Graw 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, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008
5. Reema Thareja, "Data Structures Using C", Second Edition , Oxford University Press, 2011

IT/CS 216 **OBJECT ORIENTED PROGRAMMING** **L T P C Int Ext**
3 - - 3 40 60

Semester III [Second Year]

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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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 *Text Book - 1* [CO:2] **(13)**

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 *Text Book - 1* [CO:3] **(12)**

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 *Text Book - 1* [CO:4] **(13)**

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:

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

REFERENCE BOOK(s):

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.

IT/CS 251	DIGITAL ELECTRONICS LAB	L T P C Int Ext
		- - 2 1 40 60

Semester III [Second Year]

COURSE OBJECTIVES:

At the end of the course, the student will understand

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

COURSE OUTCOMES:

After the successful completion of the course,students are 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.

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:**

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

LEARNING RESOURCES:

IT/CS 252	DATA STRUCTURES LAB	L T P C Int Ext
		- - 4 2 40 60

Semester III [Second Year]

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:

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

1. Implement various ADTs
2. Identify appropriate data structure for a given application
3. Develop application using suitable ADTs

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

Note:**

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

LEARNING RESOURCES:

IT/CS 253	OBJECT ORIENTED PROGRAMMING LAB	L	T	P	C	Int	Ext
		-	-	2	1	40	60

Semester III [Second Year]

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:

After the successful completion of the course,students are 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.

EXPERIMENTS:

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.

Note:**

LEARNING RESOURCES:

IT/CS 221	COMPUTER ORGANIZATION	L T P C Int Ext
		3 - - 3 40 60

Semester IV [Second Year]

COURSE OBJECTIVES:

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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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 *Text Book - 1* [CO:2] **(13)**

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, CISC style processors.

UNIT III *Text Book - 1* [CO:3] **(12)**

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 *Text Book - 1* [CO:4] **(13)**

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:

"Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

REFERENCE BOOK(s):

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.

IT/CS 222	OPERATING SYSTEMS	L T P C Int Ext
		3 - - 3 40 60

Semester IV [Second Year]

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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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 *Text Book - 1* [CO:2] **(14)**

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 *Text Book - 1* [CO:3] **(14)**

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 *Text Book - 1* [CO:4] **(10)**

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:

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

REFERENCE BOOK(s):

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 RESOURCES:

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/Operating%20Systems/New_index1.html: Question Bank and Test Problems
4. http://www.personal.kent.edu/~rmuhamma/OpSystems/os.html: OS Lecture Notes

IT/CS 223 **DATABASE MANAGEMENT SYSTEMS** **L T P C Int Ext**
3 - - 3 40 60

Semester IV [Second Year]

COURSE OBJECTIVES:

At the end of the course, the student 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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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 *Text Book - 1* [CO:2] **(12)**

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 *Text Book - 1* [CO:3] **(14)**

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 *Text Book - 1* [CO:4] **(12)**

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:

Database Systems, Ramez Elmasri and Shamkant B.Navathe, Pearson Education, 6th edition.

REFERENCE BOOK(s):

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.

IT/CS 224 **FORMAL LANGUAGES AND AUTOMATA THEORY** **L T P C Int Ext**

3 - - 3 40 60

Semester IV [Second Year]

COURSE OBJECTIVES:

At the end of the course the students 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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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 ε transitions:** Use of ε - transition, notation for an ε - NFA, Epsilon closures, extended transitions and languages, Applications.

UNIT II *Text Book - 1* [CO:2] **(12)**

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 *Text Book - 1* [CO:3] **(14)**

(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 *Text Book - 1* [CO:4] **(12)**

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:

TEXT BOOK:

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

REFERENCE BOOK(s):

1. Daniel I.A.Cohen, 'Computer Theory', Wiley Publications
2. KLP Mishra & N.Chandrasekharan, 'Theory of Computation', PHI.
3. Micheal Sipser, "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.

WEB RESOURCES:

1. Dexter C. Kozen, "Automata and Computability", Undergraduate Texts in Computer Science, Springer.
2. John Martin, "Introduction to Languages and The Theory of Computation", Tata McGraw Hill.

IT/CS 225	HUMANITIES ELECTIVE-I	L T P C Int Ext 3 - - 3 40 60

Semester IV [Second Year]

COURSE OBJECTIVES:

COURSE OUTCOMES:

UNIT I ()

UNIT II ()

UNIT III ()

UNIT IV ()

LEARNING RESOURCES:

IT/CS 226	OPEN ELECTIVE-I	L T P C Int Ext
		3 - - 3 40 60

Semester IV [Second Year]

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 Syster	MEOL01	Automotive Engineering
MEOL02	Robotic Engineering	MEOL03	Introduction to Operations Research
MEOL04	Mechatronics	MEOL05	Applied Mechanics & Mechanical Engineering

IT/CS 261	OPERATING SYSTEMS LAB	L T P C Int Ext
		- - 4 2 40 60

Semester IV [Second Year]

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:

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

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.

EXPERIMENTS:

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.

Note:**

LEARNING RESOURCES:

IT/CS 262 **DATABASE MANAGEMENT SYSTEMS LAB** **L T P C Int Ext**

- - 4 2 40 60

Semester IV [Second Year]

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:

After the successful completion of the course,students are 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.

EXPERIMENTS:

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 database b)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 attributes
   b) Distinct output values
   c) Renaming attributes
   d) Computed attributes
   e) Simple-complex conditions (AND, OR, NOT)
   f) Partial Matching operators (LIKE, %, _, *, ?)
   g) 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) Difference
   c) 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

Note:**

1. a)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. b)In Third lab cycle students have to write PL/SQL programs by covering concepts from 8 to 12.

LEARNING RESOURCES:

IT/CS 311	COMPUTER NETWORKS	L T P C Int Ext
		3 - - 3 40 60

Semester V [Third Year]

COURSE OBJECTIVES:

At the end of the course the students will understand

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:

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

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.

UNIT I *Text Book - 1* [CO:1] **(14)**

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

UNIT II *Text Book - 1* [CO:2] **(12)**

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 *Text Book - 1* [CO:3] **(12)**

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 *Text Book - 1* [CO:4] **(12)**

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 Bandwith 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:

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

REFERENCE BOOK(s):

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.

IT/CS 312 **DESIGN & ANALYSIS OF ALGORITHMS** **L T P C Int Ext**
3 - - 3 40 60

Semester V [Third Year]

COURSE OBJECTIVES:

At the end of the course the students will understand

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

COURSE OUTCOMES:

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

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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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 *Text Book - 1* [CO:2] **(12)**

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, biconnected components.

UNIT III *Text Book - 1* [CO:3] **(14)**

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 *Text Book - 1* [CO:4] **(12)**

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:

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

REFERENCE BOOK(s):

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

IT/CS 313	WEB TECHNOLOGIES	L T P C Int Ext
		3 - - 3 40 60

Semester V [Third Year]

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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - I* [CO:1] **(12)**

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

UNIT II *Text Book - I* [CO:2] **(14)**

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

UNIT III *Text Book - II* [CO:3] **(12)**

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.

UNIT IV *Text Book - II* [CO:4] **(12)**

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(s):

1. Harvey M. Deitel and Paul J.Deitel, "Internet & World Wide Web How to Program", 4/e, Pearson Education.
2. Subrahmanyam Allamaraju and Cedric Buest, "Professional Java Server Programming: J2EE".

REFERENCE BOOK(s):

1. Jason Cranford Teague "Visual Quick Start Guide CSS, DHTML & AJAX", 4/ e, "Pearson Education".

2. Tom Nerino Doli 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 - Uttam K.Roy, Oxford University Press, 2010.

WEB RESOURCES:

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

IT/CS 314 **SOFTWARE ENGINEERING** **L T P C Int Ext**
3 - - 3 40 60

Semester V [Third Year]

COURSE OBJECTIVES:

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. Requirements for Modelling and design.
4. Quality management by applying various Testing Strategies.

COURSE OUTCOMES:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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 *Text Book - 1* [CO:2] **(13)**

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 *Text Book - 1* [CO:3] **(12)**

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 *Text Book - 1* [CO:4] **(13)**

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:

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

REFERENCE BOOK(s):

1. Ugrasen Suman, Software Engineering, Concepts and Practices, Cengage Publications.
2. Ian Sommerville, Software Engineering, Sixth Edition, Pearson Education.
3. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, Second Edition, PHI.

4. Rajib Mall, Fundamentals of Software Engineering, Second Edition, PHI.

WEB RESOURCES:

1. Agile Project Management: Best Practices and Methodologies -https://www.altexsoft.com/whitepapers/agile-project-management-best-practices-and-methodologies/
2. Software Engineering Resources : - www.rspa.com/spi/
3. Carnegie Mellon University, Software Engineering Institute, www.sei.cmu.edu/

IT/CS 315	PROFESSIONAL ELECTIVE-I	L T P C Int Ext 3 - - 3 40 60

Semester V [Third Year]

COURSE OBJECTIVES:

COURSE OUTCOMES:

UNIT I **()**

UNIT II **()**

UNIT III **()**

UNIT IV **()**

LEARNING RESOURCES:

IT/CS 316	OPEN ELECTIVE-II	L T P C Int Ext 3 - - 3 40 60

Semester V [Third Year]

COURSE OBJECTIVES:

COURSE OUTCOMES:

UNIT I **()**

UNIT II **()**

UNIT III **()**

UNIT IV **()**

LEARNING RESOURCES:

IT/CS 351	DESIGN & ANALYSIS OF ALGORITHMS LAB	L T P C Int Ext
		- - 4 2 40 60

Semester V [Third Year]

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:

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

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

EXPERIMENTS:

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.

Note:**

1. **Design, implement and test the programs for the above problems in any programming language:**

LEARNING RESOURCES:

IT/CS 352	WEB TECHNOLOGIES LAB	L T P C Int Ext
		- - 4 2 40 60

Semester V [Third Year]

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:

After the successful completion of the course,students are 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.

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.

Note:**

IT/CS 353	SOFTWARE ENGINEERING LAB	L T P C Int Ext
		- - 4 2 40 60

Semester V [Third Year]

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:

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

1. know 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. analyze interactions among analysis classes for developing the class model and identify the dynamic behaviour of the system.
4. identify the functionality of each UML model in developing and deploying object-oriented software.

EXPERIMENTS:

1. ANALYSIS
   1. Problem Statement
   2. Requirements elicitation
   3. System Requirements Specification
2. 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.
3. 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
4. DESIGN AND IMPLEMENTATION
   18. Refine attributes, methods and relationships among classes.
   19. Construction of UML component diagrams.
   20. Construction of UML deployment diagrams.
5. 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.

Note:**

LEARNING RESOURCES:

IT/CS 321	COMPILER DESIGN	L T P C Int Ext
		3 - - 3 40 60

Semester VI [Third Year]

COURSE OBJECTIVES:

To understand different phases of compiler and lexical analyzer.

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

COURSE OUTCOMES:

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

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.

UNIT I [CO:1] **(13)**

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 [CO:2] **(13)**

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 [CO:3] **(12)**

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 [CO:4] **(12)**

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:

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

REFERENCE BOOK(s):

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

IT/CS 322	DATA ENGINEERING	L T P C Int Ext
		3 - - 3 40 60

Semester VI [Third Year]

COURSE OBJECTIVES:

To understand basics of data warehousing and data mining.

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

COURSE OUTCOMES:

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

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.

UNIT I *Text Book - 1* [CO:1] **(13)**

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 *Text Book - 1* [CO:1,2] **(12)**

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 *Text Book - 1* [CO:3] **(12)**

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 *Text Book - 1* [CO:4] **(13)**

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, MichelineKamber, and Jian Pei, 3/e, Morgan Kaufmann Publishers.

REFERENCE BOOK(s):

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 [R18] – ARTIFICIAL INTELLIGENCE**
Syllabus

COURSE OBJECTIVES:

At the end of the course the students will understand the

1. To present fundamental concepts and problem solving methodologies of artificial intelligence.
2. To learn various search strategies and game playing methods
3. To describe logical representation of natural language sentences.
4. To present various knowledge representation strategies.

COURSE OUTCOMES:

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

1. Explain the fundamental concepts of artificial intelligence and state space representation of a problem.
2. Apply heuristic search techniques for solving simple AI problems and game playing strategies.
3. Represent the given natural language sentences in predicate/proposition logic as rules for inferring new knowledge using forward/ backward reasoning.
4. Represent the given natural language information as weak or strong slot-and-filler structures and discuss various planning techniques.

UNIT I [CO:1] (12 Periods)

Introduction to Artificial Intelligence: Introduction, Brief History, Intelligent Systems, Foundations of Al, Sub-areas of AI, Applications, Tic-Tac-Toe Game Playing, Development of AI Languages, Current Trends in AI.

Problem Solving: State Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of Problem.

UNIT II [CO:2] (13 Periods)

Search Techniques: Exhaustive Searches, Heuristic Search Techniques, Iterative Deepening A*, Constraint Satisfaction.

Problem Reduction and Game Playing: Introduction, Problem Reduction, Game Playing, Bounded Look-Ahead Strategy and Use of, Alpha- Beta Pruning, Two-Player Perfect Information Games.

UNIT III [CO:3] (12 Periods)

Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, Resolution Refutation in Proportional Logic, Predicate Logic, Logic Programming.

UNIT IV [CO:4] (13 Periods)

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

Advanced Knowledge Representation Techniques: Introduction, Conceptual Dependency theory, Script Structure, CYC Theory, Case Grammars, and Semantic Web.

Learning Resources:

Text Book:

1. Saroj Kaushik, Artificial Intelligence, CENGAGE Learning.

Reference Books:

1. Stuart Russel and Peter Norvig, Artificial Intelligence – A Modern Approach, 3rd Edition, Pearson Education/ PHI.
2. Elaine Rich & Kevin Knight, Artificial Intelligence, Pearson Education.

IT/CS 324	CRYPTOGRAPHY & NETWORK SECURITY	L T P C Int Ext
		3 - - 3 40 60

Semester VI [Third Year]

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:

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

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 and digital signature protocols.
4. Discuss the authentication applications, web and E-mail security mechanisms.

UNIT I *Text Book - 1* [CO:1] **(13)**

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* [CO:2] **(13)**

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* [CO:3] **(12)**

Hash Functions And Digital SignaturesCryptographic 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* [CO:4] **(12)**

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(s):

1. William Stallings, Cryptography and Network Security, 4th Edition, Pearson Education. (UNIT I).
2. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education. (UNIT II, III, IV)

IT/CS 325	PROFESSIONAL ELECTIVE-II	L T P C Int Ext 3 - - 3 40 60

Semester VI [Third Year]

COURSE OBJECTIVES:

COURSE OUTCOMES:

UNIT I **()**

UNIT II **()**

UNIT III **()**

UNIT IV **()**

LEARNING RESOURCES:

IT/CS 326	OPEN ELECTIVE-III	L T P C Int Ext 3 - - 3 40 60

Semester VI [Third Year]

COURSE OBJECTIVES:

COURSE OUTCOMES:

UNIT I **()**

UNIT II **()**

UNIT III **()**

UNIT IV **()**

LEARNING RESOURCES:

IT/CS 361	ARTIFICIAL INTELLIGENCE LAB	L T P C Int Ext
		- - 4 2 40 60

Semester VI [Third Year]

COURSE OBJECTIVES:

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:

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

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.

EXPERIMENTS:

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. Implement simple Chatbot
10. Write a program to perform classification for the give sentence

Note:**

LEARNING RESOURCES:

IT/CS 362	PROJECT - I	L T P C Int Ext
		- - 4 1 100

Semester VI [Third Year]

COURSE OBJECTIVES:

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

- **The importance of a component and functionality of each UML model element throughout the software process.**
- **How to read and interpret the artifacts of requirements that are used as starting points for analysis and design.**
- **Analysis of interactions of analysis classes in identify design model elements.**
- **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

•know the importance of systems analysis and design in solving computer Based problems.

•develop UML models which are used during the phases of the Rational Unified Process.

•analyze interactions among analysis classes for developing the class model and identify the dynamic behaviour of the system.

•identify the functionality of each UML model in developing and deploying object-oriented software.

Lab Cycle - I

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 Cycle - II

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

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 / system chosen by the Project batch and a report is to be submitted at the semester end by the batch.

IT/CS 363	TERM PAPER	L T P C Int Ext
		- - 4 1 100

Semester VI [Third Year]

COURSE OBJECTIVES:

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

- **To build Confidence in understanding the current technologies.**
- **Identification of the field of interest.**
- **To prepare the graduate to express the knowledge they have gained in the related areas.**

Course Outcomes

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

- **identify a technical problem and mingle with the latest developments in the selected area.**
- **develop/study a prototype.**
- **develop solution to the selected problem.**
- **prepare a technical report.**

IT/CS 411	MACHINE LEARNING	L T P C Int Ext
		3 - - 3 40 60

Semester VII [Fourth Year]

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:

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

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.

UNIT I *Text Book - 1* [CO:1] **(13)**

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 *Text Book - 1* [CO:2] **(14)**

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 *Text Book - 1* [CO:3] **(13)**

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 *Text Book - 1* [CO:4] **(10)**

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:

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

REFERENCE BOOK(s):

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

IT/CS 412	NEURAL NETWORKS	L T P C Int Ext
		3 - - 3 40 60

Semester VII [Fourth Year]

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:

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

1. Explain the features of single and multilayer neural networks.
2. Discuss different 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.

UNIT I *Text Book - 1* [CO:1] **(13)**

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

UNIT II *Text Book - 1* [CO:2] **(13)**

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

UNIT III *Text Book - 1* [CO:3] **(10)**

Adaptive Resonance Theory: Introduction, ART1, ART2.

UNIT IV *Text Book - 1* [CO:4] **(14)**

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

LEARNING RESOURCES:

TEXT BOOK:

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

REFERENCE BOOK(s):

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.

IT/CS 413	PROFESSIONAL ELECTIVE-III	L T P C Int Ext 3 - - 3 40 60

Semester VII [Fourth Year]

COURSE OBJECTIVES:

COURSE OUTCOMES:

UNIT I ()

UNIT II ()

UNIT III ()

UNIT IV ()

LEARNING RESOURCES:

IT/CS 414	PROFESSIONAL ELECTIVE-IV	L T P C Int Ext 3 - - 3 40 60

Semester VII [Fourth Year]

COURSE OBJECTIVES:

COURSE OUTCOMES:

UNIT I **()**

UNIT II **()**

UNIT III **()**

UNIT IV **()**

LEARNING RESOURCES:

IT/CS 415	HUMANITIES ELECTIVE-II	L T P C Int Ext 3 - - 3 40 60

Semester VII [Fourth Year]

COURSE OBJECTIVES:

COURSE OUTCOMES:

UNIT I ()

UNIT II ()

UNIT III ()

UNIT IV ()

LEARNING RESOURCES:

IT/CS 451	MACHINE LEARNING LAB	L T P C Int Ext
		- - 2 1 40 60

Semester VII [Fourth Year]

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:

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

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

EXPERIMENTS:

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 naive 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 naive 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.

Note:**

LEARNING RESOURCES:

IT/CS 452	PROJECT - II	L T P C Int Ext
		- - 4 2 40 60

Semester VII [Fourth Year]

COURSE OBJECTIVES:

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

At the end of the course the students will
•Groom up their Personality towards the Industrial Standards.
•Test theoretical and practical skills on various subjects by working on real-time projects.
•Understand the application of software Engineering concepts in completing their project.
• Have awareness about the technology updates to beat the present hectic competition.

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

- **work in a team to select a problem for project work.**
- **review and evaluate the available literature on the chosen problem.**
- **formulate the methodology to solve the identified problem.**
- **apply the principles, tools and techniques to solve the problem.**
- **prepare and present project report.**

The Project work shall be carried out by a batch consisting not more than four students. It should help the students to comprehend and apply different theories and technologies that they have learn through and are learning. It should lead to a substantial result as a comparative study, a new application of the technologies available or some extension to the works carried out by some researcher and published in conference/ journal. Each batch must carry out the analysis, design, implementation and testing of the entire project basing on the Software Engineering principles. There shall be a total of four reviews for each batch.

0th review : The idea/concept for their project shall be presented to the panel and get the approval.
1st review : The analysis and design carried out.
2nd review : The implementation and the testing done.
3rd review : Over all presentation of the work.

A comprehensive report is to be submitted at the end of the semester, which is certified by the concerned guide and the HOD.

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IT/CS 453	SUMMER INTERNSHIP	L T P C	INT EXT
		2	100

SEMESTER VII[FOURTH YEAR]

IT/CS 421	PROFESSIONAL ELECTIVE-V (MOOCS)	L	T	P	C	Int	Ext
		3	-	-	3	-	100

Semester VIII [Fourth Year]

COURSE OBJECTIVES:

COURSE OUTCOMES:

UNIT I ()

UNIT II ()

UNIT III ()

UNIT IV ()

LEARNING RESOURCES:

IT/CS 422	OPEN ELECTIVE-IV (MOOCS)	L T P C Int Ext 3 - - 3 - 100

Semester VIII [Fourth Year]

COURSE OBJECTIVES:

COURSE OUTCOMES:

UNIT I ()

UNIT II ()

UNIT III ()

UNIT IV ()

LEARNING RESOURCES:

IT/CS 461	PROJECT - III	L T P C Int Ext
		- - 12 6 40 60

Semester VIII [Fourth Year]

COURSE OBJECTIVES:

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

At the end of the course the students will

- **Groom up their Personality towards the Industrial Standards.**
- **Test theoretical and practical skills on various subjects by working on real-time projects.• Understand the application of software Engineering concepts in completing their project.• Have awareness about the technology updates to beat the present hectic competition.**

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

- **work in a team to select a problem for project work.**
- **review and evaluate the available literature on the chosen problem.**
- **formulate the methodology to solve the identified problem.**
- **apply the principles, tools and techniques to solve the problem.**
- **prepare and present project report.**

The Project work shall be carried out by a batch consisting not more than four students. It should help the students to comprehend and apply different theories and technologies that they have learn through and are learning. It should lead to a substantial result as a comparative study, a new application of the technologies available or some extension to the works carried out by some researcher and published in conference/ journal. Each batch must carry out the analysis, design, implementation and testing of the entire project basing on the Software Engineering principles. There shall be a total of four reviews for each batch.

0th review	**:**	**The idea/concept for their project shall be presented to the panel and get the approval.**
1st review	**:**	**The analysis and design carried out.**
2nd review	**:**	**The implementation and the testing done.**
3rd review	**:**	**Over all presentation of the work.**

A comprehensive report is to be submitted at the end of the semester, which is certified by the concerned guide and the HOD. Students are published their paper in journals/conferences. .

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:

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

1. apply UNIX commands for solving problems and work with AWK programming.
2. develop shell 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.

UNIT I *Text Book - 1* [CO:1] **(15)**

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.**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.

UNIT II *Text Book - 1* [CO:2] **(15)**

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 *Text Book - 1* [CO:3] **(16)**

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 *Text Book - 1* [CO:4] **(15)**

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:

"Unix for programmers and users" 3rd edition by Graham Glass, King Ables, Pearson education

REFERENCE BOOK(s):

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 RESOURCES:

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

ITEL02 **INTERACTIVE COMPUTER GRAPHICS** **L T P C Int Ext**

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:

After successful completion of the course, the students are 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

UNIT I *Text Book - 1* [CO:1] **(17)**

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 *Text Book - 1* [CO:2] **(17)**

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 *Text Book - 1* [CO:3] **(15)**

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 *Text Book - 1* [CO:4] **(15)**

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:

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

REFERENCE BOOK(s):

1. "Computer Graphics Principles & Practice", Second Edition in C, James.D.Foley, Andries VanDam, 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", Shalini Govil, Pai, 2005, Springer.

WEB RESOURCES:

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

ITEL03 **BIG DATA ANALYTICS** **L T P C Int Ext**

COURSE OBJECTIVES:

At the end of the course the students will understand

1. Big data analytics techniques
2. Techniques required to manage and analyse 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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(10)**

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* [CO:2] **(15)**

Data Mining: What is Data Mining?, Statistical Limits on Data Mining. Things useful to know.**Map Reduce Software Stack:** Distributed File Systems, MapReduce, Algorithms Using Map Reduce, Extensions to MapReduce, 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* [CO:3] **(15)**

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* [CO:4] **(10)**

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 BOOK(s):

1. BIG DATA Black Book, Dreamtech Press, 2015. (UNIT I).

2. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of Massive Datasets, 2nd Edition, 2014. (Unit- II to UNIT-IV).

REFERENCE BOOK(s):

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 RESOURCES:

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/

ITEL04 **EMBEDDED SYSTEMS** **L T P C Int Ext**

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:

After successful completion of the course, the students are 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 *Text Book - 1* [CO:1] **(15)**

A First Look at the Embedded Systems: Examples of Embedded Systems (Telegraph, cordless Bar-code scanner, Laser Printer, underground tank monitor, Nuclear Reactor Monitor)**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 *Text Book - 1* [CO:2] **(15)**

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 *Text Book - 1* [CO:3] **(10)**

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 *Text Book - 1* [CO:4] **(10)**

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

LEARNING RESOURCES:

TEXT BOOK:

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

REFERENCE BOOK(s):

1. Sriram V.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.

ITEL05 **OPEN SOURCE SYSTEMS** **L T P C Int Ext**

COURSE OBJECTIVES:

At the end of the course, the students will understand

1. usage of PHP for developing web applications.
2. PHP Browser Handling Power.
3. accessing web form data at the server
4. creation of database driven web applications.
5. usage of Ajax for partial rendering.
6. XML and RSS with PHP.

COURSE OUTCOMES:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(15)**

Essential PHP, Operators and Flow Control, String Arrays, CreatingFunctions

UNIT II *Text Book - 1* [CO:2] **(17)**

Reading Data in Web Pages, PHP Browser - HANDLING Power, ObjectOriented Programming, Advanced Object Oriented Programming

UNIT III *Text Book - 1* [CO:3] **(15)**

File Handling, Working with Databases, Sessions, Cookies, and FTP, Ajax

UNIT IV *Text Book - 1* [CO:4] **(13)**

Advanced Ajax, Drawing Images on the Server, XML and RSS

LEARNING RESOURCES:

TEXT BOOK:

PHP: The Complete Reference By Steven Holzner, TATA McGraw Hill.

REFERENCE BOOK(s):

1. Beginning PHP and MySQL: From Novice to Professional, By by W. Jason Gilmore, Apress.
2. PHP 6 and MySQL 6 Bible, By Steve Suehring, Tim Converse, Joyce Park, Wiley Publishing, Inc.

ITEL06 **DIGITAL IMAGE PROCESSING** **L T P C Int Ext**

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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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 *Text Book - 1* [CO:2] **(14)**

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 *Text Book - 1* [CO:3] **(14)**

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 *Text Book - 1* [CO:4] **(12)**

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:

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

REFERENCE BOOK(s):

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.

ITEL07 **NETWORK PROGRAMMING** **L T P C Int Ext**

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:

After successful completion of the course, the students are 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

UNIT I *Text Book - 1* [CO:1] **(15)**

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,and inet_ntoa Functions, inet_pton and inet_ntop Functions.

UNIT II *Text Book - 1* [CO:2] **(15)**

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_cli Function,TCP Echo Server,pselect Function,poll Function,TCP Echo Server

UNIT III *Text Book - 1* [CO:3] **(15)**

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 inetd Superserver:**Introduction, syslogd Daemon, syslog Function, daemon_init Function, inetd Daemon, daemon_inetd Function

UNIT IV *Text Book - 1* [CO:4] **(15)**

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:

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

REFERENCE BOOK(s):

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 RESOURCES:

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

ITEL08 **MOBILE APP DEVELOPMENT** **L T P C Int Ext**

COURSE OBJECTIVES:

At the end of the course the students will understand the

1. To provide knowledge on tools required for Mobile Application Development using Android.
2. To provide knowledge on Android User Interface using Views.
3. To provide knowledge on Data Persistence.
4. To make the student to learn Messaging in Android.

COURSE OUTCOMES:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(15)**

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 *Text Book - 1* [CO:2] **(15)**

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 *Text Book - 1* [CO:3] **(15)**

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 *Text Book - 1* [CO:4] **(15)**

Content Providers: Using a Content Provider, Creating Your Own Content Providers.**Messaging:** SMS Messaging, Sending E-Mail.

LEARNING RESOURCES:

TEXT BOOK:

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

REFERENCE BOOK(s):

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.

ITEL09 **INTERNET OF THINGS** **L T P C Int Ext**

COURSE OBJECTIVES:

At the end of the course, the student will understand

1. characteristics of sensors and its real-world applications in IOT.
2. familiarize the various IoT applications and its infrastructures.
3. the IOT devices programming with Python.
4. concepts of interfacing hardware to develop IoT projects.

COURSE OUTCOMES:

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

1. Identify and Classify IoT sensors for various applications.
2. Verify and Asses the infrastructure needed IoT applications.
3. Develop programming solutions for IoT devices.
4. Model and Implement IoT projects.

UNIT I *Text Book - 1* [CO:1] **(9)**

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 - 1* [CO:2] **(12)**

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* [CO:3] **(12)**

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* [CO:4] **(12)**

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 BOOK(s):

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024'
2. Arshdeep Bahga and Vijay Madisetti, Internet of Things A Hands-on Approach, Universities Press, 2015, ISBN: 9788173719547.

REFERENCE BOOK(s):

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 RESOURCES:

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/.

ITEL10 OBJECT ORIENTED ANALYSIS AND DESIGN L T P C Int Ext

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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(15)**

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.>/p>**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 *Text Book - 1* [CO:2] **(15)**

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 *Text Book - 1* [CO:3] **(15)**

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 *Text Book - 1* [CO:4] **(15)**

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:

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

REFERENCE BOOK(s):

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.

WEB RESOURCES:

1.

2.

ITEL11 **DISTRIBUTED COMPUTING** **L T P C Int Ext**

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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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 *Text Book - 1* [CO:2] **(12)**

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 *Text Book - 1* [CO:3] **(12)**

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 *Text Book - 1* [CO:4] **(15)**

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:

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

REFERENCE BOOK(s):

1. Andrew S. Tanenbaum, Maarten Van Steen, Distributed Systems Principles and Paradigms, Prentice Hall India, 2004.
2.

ITEL12 PRINCIPLES OF PROGRAMMING LANGUAGES L T P C Int Ext

COURSE OBJECTIVES:

At the end of the course, the student will understand

1. 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. The features of logic languages and scripting languages.

COURSE OUTCOMES:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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 *Text Book - 1* [CO:2] **(12)**

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 *Text Book - 1* [CO:3] **(12)**

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 *Text Book - 1* [CO:4] **(12)**

Logic Languages: Logic Programming Concepts, Prolog, Theoretical Foundations, Logic Programming in Perspective.**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:

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

REFERENCE BOOK(s):

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

WEB RESOURCES:

(Industry Related subject recommended by BoS members under Professional Elective II – for the academic year 2020-2021)

For B.Tech. Semester VI [THIRD YEAR]

CS/IT326(CSEL13/ITEL13)

SOFTWARE TESTING METHODOLOGIES

L	T	P	C	Int	Ext
3	0	0	3	40	60

Course Objectives:

At the end of the course, the student will understand

1. Software testing process effectively.
2. design of high quality tests during all phases of software development.
3. criteria-based test design
4. automation tools used in software development

Course Outcomes:

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

1. apply software testing knowledge and engineering methods.
2. design and conduct a software test process for a software testing project..
3. use software testing methods and modern software testing tools for their testing projects.
4. identify and use various automation testing tools, and develops test cases for object oriented and web based systems.

UNIT I **[CO1] (15)**

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, Definition, Model for testing, Effective Vs Exhaustive Software Testing.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, relating test life cycle to developmentlife cycle Software Testing Methodology.

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, How to verify code, Validation

UNIT II **[CO2] (15)**

Dynamic Testing I: Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing

Dynamic Testing II: White-Box Testing: need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing

UNIT III **[CO3] (15)**

Static Testing: inspections, Structured Walkthroughs, Technical reviews

Validation activities: Unit testing, Integration Testing,. Function testing, system testing, acceptance testing

Regression testing: Progressives Vs regressive testing, Regression testability, Objectives of regression testing, When regression testing done?, Regression testing types, Regression testing techniques.

Debugging : Debugging: an Art or Technique? Debugging Process , Debugging Is Difficult , Debugging Techniques , Correcting the Bugs , Debuggers

UNIT IV **[CO4] (15)**

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools.

Testing Object Oriented Software: basics, Object oriented testing

Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems.

Text Books:

1. Software Testing, Principles and Practices, Naresh Chauhan, Oxford Press

Reference books:

1. Software testing techniques - Baris Beizer, International Thomson computer press, second edition.
2. Software Testing, Principles, techniques and Tools, M G Limaye, TMH
3. Effective Methods for Software testing, Willian E Perry, 3ed, Wiley
4. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson
5. Software Testing- Yogesh Singh, CAMBRIDGE

ITEL14 **ADVANCED COMPUTER ARCHITECTURE** **L T P C Int Ext**

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:

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

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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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 *Text Book - 1* [CO:2] **(14)**

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 *Text Book - 1* [CO:3] **(12)**

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 *Text Book - 1* [CO:4] **(12)**

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:

Kai Hwang, "Advanced Computer Architecture"; TMH. 3rd Edition,2016

REFERENCE BOOK(s):

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.

ITEL15 DESIGN AND ANALYSIS OF PARALLEL ALGORITHMS L T P C Int Ext

COURSE OBJECTIVES:

1. Realize the use basic 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:

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

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.

UNIT I *Text Book - 1* [CO:1] **(13)**

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 *Text Book - 1* [CO:2] **(12)**

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 *Text Book - 1* [CO:3] **(12)**

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 *Text Book - 1* [CO:4] **(13)**

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:

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

REFERENCE BOOK(s):

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.

ITEL16 **.NET TECHNOLOGIES** **L T P C Int Ext**

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.

UNIT I [CO:1] **(12)**

Introducing C#, Writing a C# Program, Variables and Expressions.Flow Control, More About Variables, Functions.

UNIT II [CO:2] **(12)**

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

UNIT III [CO:3] **(14)**

Generics, Additional C# Techniques, Basic Desktop Programming. Advanced Desktop Programming.Advanced Cloud Programming

UNIT IV [CO:4] **(12)**

Files, XML and JSON, LINQ, DATABASES

LEARNING RESOURCES:

TEXT BOOK:

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

REFERENCE BOOK(s):

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 RESOURCES:

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

ITEL17 **SEMANTIC WEB** **L T P C Int Ext**

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:

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

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

UNIT I [CO:1] **(12)**

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 [CO:2] **(12)**

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 [CO:3] **(12)**

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

UNIT IV [CO:4] **(12)**

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 BOOK(s):

1. Thinking on the Web - Berners Lee, Godel and Turing, Wileyinterscience,2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer,2007.

REFERENCE BOOK(s):

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.

ITEL18 **WIRELESS NETWORKS** **L T P C Int Ext**

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.

UNIT I [CO:1] **(12)**

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 [CO:2] **(12)**

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 [CO:3] **(12)**

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 [CO:4] **(12)**

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:

J.Schiller, “Mobile communications”, 2nd edition, 2003, Pearson.

REFERENCE BOOK(s):

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 RESOURCES:

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://getitnew.com/air-lap1242ag-a-k9ciscoaironet1242agwirelessaccesspoint.aspx

ITEL19 **CLOUD COMPUTING** **L T P C Int Ext**

COURSE OBJECTIVES:

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.

UNIT I [CO:1] **(14)**

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 [CO:2] **(12)**

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 [CO:3] **(12)**

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 [CO:4] **(12)**

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:

Rajkumar Buyya, James Broberg, AndrZejGoscinski, Cloud Computing Principles and Paradigms, Wiley Publications.

REFERENCE BOOK(s):

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

ITEL20 **QUANTUM COMPUTING** **L T P C Int Ext**

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. 3Apply Shor's and Grover's algorithm in Quantum computing.
4. Relate the Quantum computing applications to the software.

UNIT I [CO:1] **(12)**

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 [CO:2] **(12)**

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 [CO:3] **(14)**

Shor's Algorithm and Quantum Fourier TransformGrover's Algorithm (Quantum Search Algorithms)

UNIT IV [CO:4] **(12)**

Physical Realization of Quantum ComputersQuantum Computing Software

LEARNING RESOURCES:

TEXT BOOK:

Vishal Sahni. "Quantum Computing", TMH, 2007.

REFERENCE BOOK(s):

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)

ITEL21 **NATURAL LANGUAGE PROCESSING** **L T P C Int Ext**

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:

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

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.

UNIT I [CO:1] **(12)**

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 [CO:2] **(12)**

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 [CO:3] **(12)**

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 [CO:4] **(12)**

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 SituationsDiscourse 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:

James Allen, Natural Language Understanding, Second Edition, Pearson Education.

REFERENCE BOOK(s):

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.

ITEL22 **VIRTUAL REALITY** **L T P C Int Ext**

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. Relate the 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.

UNIT I [CO:1] **(12)**

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 [CO:2] **(14)**

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 [CO:3] **(12)**

VR Programming: Toolkits and Scene Graphs, World Toolkit, 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 [CO:4] **(12)**

Traditional VR Applications: Medical Applications of VR, Education, Arts and Entertainment, Military VR ApplicationsEmerging Applications of VR : VR Applications in Manufacturing, Applications of VR in Robotics, Information Visualization.

LEARNING RESOURCES:

TEXT BOOK:

GrigoreC.Burdea, Philippe Coiffet. "Virtual Reality" Second Edition, Wiley India.

ITEL23 **CYBER SECURITY** **L T P C Int Ext**

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.

COURSE OUTCOMES:

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

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.

UNIT I [CO:1] **(13)**

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 [CO:2] **(13)**

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 [CO:3] **(12)**

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 [CO:4] **(12)**

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 BOOK(s):

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.

ITEL24 **BLOCK CHAIN TECHNOLOGY** **L T P C Int Ext**

COURSE OBJECTIVES:

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.

UNIT I [CO:1] **(15)**

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 [CO:2] **(15)**

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 [CO:3] **(15)**

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 [CO:4] **(15)**

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:

SeberriusJeffery,"Block Chain" 2nd Edition Publishers details 2015

ITEL25 **MULTICORE TECHNOLOGIES** **L T P C Int Ext**

COURSE OBJECTIVES:

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:

After successful completion of the course, the students are 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.

UNIT I [CO:1] **(15)**

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 [CO:2] **(15)**

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 [CO:3] **(15)**

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 [CO:4] **(15)**

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:

Shameem Akhter and Jason Roberts, Multi-core Programming: Increasing Performance through software Multi-Threading, Intel Press, 2006.

REFERENCE BOOK(s):

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.

(Industry Related subject recommended by BoS members under Professional Elective IV – for the academic year 2021-2022)

For B.Tech. Semester VII [FOURTH YEAR]

IT 416(ITEL26)

Agile Software Development

Lectures / Tutorials : 4 Periods / week *Sessional Marks : 40*

University Exam. : 3 hrs. *University Exam. Marks : 60*

Course Objectives

At the end of the course the students will understand

- the fundamental principles and practices associated with each of the agile development methods.
- how agile methods scale to large and distributed projects.
- perform in-depth explorations into aspects of agile development.

Course Outcomes

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

- Familiarize with various agile development methods called Scrum, XP, FDD, DSDM methods.
- Familiarize with inception phase of agile development, and scope and vision of the project.
- Familiarize with technical strategy and release planning with agile development.
- Familiarize with construction and transition phases of agile development.
- apply Scrum and Sprint agile methodologies in system development.

UNIT – I

Introduction to Agile and Lean: Toward a Disciplined Agile Manifesto, Disciplined Agile Values, Disciplined Agile Principles, Lean Principles, Reality over Rhetoric.

Foundations of Disciplined Agile Delivery: Scrum, Extreme Programming (XP), Agile Modeling (AM), Agile Data, Lean Software Development, Open Unified Process (OpenUP).

Roles, Rights, and Responsibilities: The Rights of Everyone, The Responsibilities of Everyone, The DAD Roles.

UNIT – II

The Inception Phase: How the Inception Phase Works, Aligning with the Rest of the Enterprise, Securing Funding, Other Inception Activities, When Do You Need an Inception Phase?, Inception Phase Patterns, Inception Phase Anti-Patterns.

Identifying a Project Vision: What's in a Vision?, How Do You Create a Vision?, Capturing Your Project Vision, Bringing Stakeholders to Agreement Around the Vision.

Identifying the Initial Scope: Choosing the Appropriate Level of Initial Detail, Choosing the Right Types of Models, Choosing a Modeling Strategy, Choosing a Work Item Management Strategy.

UNIT – III

Identifying an Initial Technical Strategy: Choosing the Right Level of Detail, Choosing the Right Types of Models, Choosing a Modeling Strategy, Architecture throughout the Lifecycle.

Initial Release Planning: Who Does the Planning?, Choosing the Right Scope for the Plan, Choosing a General Planning Strategy, Choosing Cadences, Formulating an Initial Schedule, Estimating the Cost and Value, Identifying Risks.

UNIT – IV

The Construction Phase: How the Construction Phase Works, The Typical Rhythm of Construction Iterations, The Risk-Value Lifecycle, When Are You Ready to Deploy? , Construction Patterns, Construction Anti-Patterns.

Initiating a Construction Iteration: Why Agile Planning Is Different, Iteration Planning, Visualizing Your Plan, Look-Ahead Planning and Modeling.

The Transition Phase: How the Transition Phase Works, Planning the Transition Phase, Ensuring Your Production Readiness, Preparing Your Stakeholders for the Release, Deploying the Solution, Transition Phase Patterns, Transition Phase Anti-Patterns.

UNIT – V

Scrum Framework: Scrum Roles, Scrum Activities and Artifacts, Sprints, Daily Scrum.

Sprints: Timeboxed, Short Duration, Consistent Duration, No Goal-Altering Changes, Definition of Done.

Text Book :

1. Scott W. Ambler, Mark Lines, Disciplined Agile Delivery: A Practitioner's Guide to Agile Software Delivery in the Enterprise, IBM Press, 2012 .(UNIT – I to UNIT – IV)
2. K.S. Rubin, Essential Scrum: A Practical Guide to the Most Popular Agile Process, Addison-Wesley, 2012.(UNIT V)

Reference Books:

1. K. Beck, Test Driven Development: By Example, Addison-Wesley, 2002.
2. K. Beck, C. Andres, Extreme Programming Explained: Embrace Change, 2nd Edition, Addison-Wesley, 2004.
3. M. Cohn, Succeeding with Agile: Software Development Using Scrum, Addison-Wesley, 2010.
4. M. Fowler, Catalog of Refactorings, Published online at: http://refactoring.com/catalog/, December 2013 (last visited on: 3 August 2014).
5. K. Schwaber, J. Sutherland, The Scrum Guide, Published online at: https://www.scrum.org/scrum-guide, July 2013 (last visited on: 3 August 2014).

IT V01	ENGLISH COMPETENCY DEVELOPMENT PROGRAMME	L	T	P	C	Int	Ext
	[NON-CREDIT COURSE - ACTIVITY BASED]	2	-	-	-	100	-

LECTURE PLAN

Session Topic

1. Self Introduction
2. Self Introduction
3. Introducing Others
4. Mind Mapping -Small Talk
5. Random Operation
6. JAM & Extempores
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
* Walkietalkie https://www.teacherspayteachers.com/Store/Walkietalkie
* Alen Maley's Conversation/Rob Nolasco & Lois Arthur/Oxford University Press
* Alen Maley'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

IT V02	INTRODUCTION TO COMPUTING	L T P C Int Ext
	[NON-CREDIT COURSE]	2 - 2 - 100 -

COURSE OBJECTIVES:

1. To enable the students to gain in - depth understanding of problem.
2. To enable the students to evaluate different concepts and methods in a computer language.
3. To enable the students to analyze and develop an algorithm for a given problem.
4. To enable the students to apply their knowledge to design and develop Computer solution to real world problems.

COURSE OUTCOMES:

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

1. understand algorithm and flowchart.
2. formulate fundamental algorithms for logical problems.
3. develop an algorithm using Factoring Methods.
4. design an algorithm using array related problems.

UNIT I [CO:4] **(5)**

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

UNIT II [CO:4] **(8)**

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 [CO:4] **(8)**

FACTORING METHODS : Introduction, Finding the square root of a number, the smallestdivisor 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 anumber to large power, computing the n th Fibonacci number.

UNIT IV [CO:4] **(5)**

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:

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

ITOL01 **DATA STRUCTURES & ALGORITHMS** **L T P C Int Ext**

COURSE OBJECTIVES:

At the end of the course, the student will understand

1. To design and implementation of various basic and advanced data structures.
2. To introduce various techniques for representation of the data in the real world.
3. Acquaintance of algorithm design strategies
4. Expertise with a variety of significant algorithms

COURSE OUTCOMES:

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

1. Apply operations on linear and non-linear data structures.
2. Differentiate different types of data structures for various applications.
3. Analyze computation complexity of algorithms.
4. Design an algorithm for a given problem with an appropriate design technique.

UNIT I *Text Book - 1* [CO:1] **(14)**

Analysis of an Algorithm, Asymptotic Notations, Singly Linked lists - Representation in Memory, Abstract Data Types (ADTs) - singly linked lists, doubly - linked lists and circularly linked lists. Stack ADT and its operations using array and linked list, Queue ADT and its operations using array and linked list.

UNIT II *Text Book - 1* [CO:2] **(12)**

Basic Tree Terminologies, Different types of trees: Binary Tree, Binary Search Tree, tree traversals, Graph representation and traversals. Divide and Conquer - Control Abstraction, Merge sort, Quick sort, Binary Search.

UNIT III *Text Book - 2* [CO:3] **(12)**

Greedy Method - Control Abstraction, Knapsack Problem, Minimum Cost Spanning Trees, Single Source Shortest Paths.Dynamic Programming - General Method, Multi-stage Graph, All Pairs Shortest Paths, String Editing, Single Source Shortest Paths (General Weights).

UNIT IV *Text Book - 2* [CO:4] **(14)**

Backtracking - General Method, 8-Queens Problem, and Graph Coloring.Branch and Bound - General Method, Travelling Sales Person Problem, Knapsack problem.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education,1997.
2. E. Horowitz, S. Sahni and S.Rajsekaran, "Fundamentals of Computer Algorithms", Galgotia Publication.

REFERENCE BOOK(s):

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mc Graw 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, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008
5. Reema Thareja, "Data Structures Using C", Second Edition , Oxford University Press, 2011

ITOL02 **OPERATING SYSTEMS** **L T P C Int Ext**

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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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

UNIT II *Text Book - 1* [CO:2] **(12)**

Multithreaded Programming: Overview of Multithreading, Multithreading Models, Implicit Threading. **Process Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling.**Synchronization:** Background, The Critical-Section Problem, Peterson 'solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization.

UNIT III *Text Book - 1* [CO:3] **(12)**

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. **Virtual-Memory Management:** Background, Demand Paging, Page Replacement algorithms.

UNIT IV *Text Book - 1* [CO:4] **(10)**

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:

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

REFERENCE BOOK(s):

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.

ITOL03 **BIG DATA ANALYTICS** **L T P C Int Ext**

COURSE OBJECTIVES:

At the end of the course the students will understand

1. Big data analytic 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:

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

1. classify 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. Use mining data stream models and apply analytics principles.

UNIT I *Text Book - 1* [CO:1] **(10)**

Overview of Big Data: What is Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics. **Understanding Hadoop Ecosystem:** Hadoop EcoSystem, Hadoop Distributed File System, Hadoop YARN, Introducing HBase, Combining HBase and HDFS, Hive, Pig, Sqoop, ZooKeeper, Flume.

UNIT II *Text Book - 2* [CO:2] **(10)**

Data Mining: What is Data Mining?, Statistical Limits on Data Mining. Things useful to know.**Map Reduce Software Stack:** Distributed File Systems, MapReduce, Algorithms Using Map Reduce, Extensions to MapReduce, 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* [CO:3] **(10)**

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.

UNIT IV *Text Book - 1* [CO:4] **(10)**

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 data frames.

LEARNING RESOURCES:

TEXT BOOK(s):

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

REFERENCE BOOK(s):

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 RESOURCES:

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/

ITOL04 **WEB TECHNOLOGIES** **L T P C Int Ext**

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:

After successful completion of the course, the students are 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.

UNIT I *Text Book - 1* [CO:1] **(12)**

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

UNIT II *Text Book - 1* [CO:2] **(14)**

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

UNIT III *Text Book - 2* [CO:3] **(12)**

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.

UNIT IV *Text Book - 2* [CO:4] **(12)**

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(s):

1. Harvey M. Deitel and Paul J.Deitel, "Internet & World Wide Web How to Program", 4/e, Pearson Education.
2. Subrahmanyam Allamaraju and Cedric Buest, "Professional Java Server Programming: J2EE".

REFERENCE BOOK(s):

1. Jason Cranford Teague "Visual Quick Start Guide CSS, DHTML & AJAX", 4/ e, Pearson Education.

2. Tom Nerino Doli 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 - Uttam K.Roy, Oxford University Press, 2010.

WEB RESOURCES:

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