DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING AND APPLICATIONS

SAMBALPUR UNIVERSITY INSTITUTE OF INFORMATION TECHNOLOGY, JYOTI VIHAR, BURLA

Section - B

Syllabus Structure for
(Bachelor of Technology in Computer Science & Engineering)

(Four Years Course)

Board of Study Department of CSE&A:

1) Prof. (Dr.) Amiya Kumar Rath
2) Mr. Pradyumna Kumar Ratha
3) Mr. Kalyan Das
4) Mrs. Sushree Subhaprada Pradhan
5) Dr. (Mrs.) Madhumita Panda
6) Mr. Sibarama Panigrahi
7) Mr. Debashreet Das

	Semester – I							
S.No.	Course Code	**Course Title**	**Category**	**L**	**P**	**T**	**Credits**	**Remarks**
1	MAC111	Mathematics-I	FC(BS)	4	0	0	**4**	Common to all branch
2	PHC112	Physics-I	FC(BS)	3	0	0	**4**	
3	CSC113	Basic Electrical Engineering	FC(BE)	3	0	1	**4**	
4	EEC114	Programming in C	FC(CS)	3	0	1	**4**	
5	HSC115	English for Communication	FC(HS)	3	0	0	**3**	
6	EEL116	Basic Electrical Lab.	FC(BE)	0	3	0	**2**	
7	CSL117	Programming in C Lab.	FC(CS)	0	3	0	**2**	
8	PHL118	Physics Lab	FC(BS)	0	3	0	**2**	
						Total Credit:	**25**	

	Semester – II							
S.No.	Course Code	**Course Title**	**Category**	**L**	**P**	**T**	**Credits**	**Remarks**
1	MAC 121	Mathematics-II	FC(BS)	4	0	0	**4**	Common to all branch
2	PHC 122	Physics-II	FC(BS)	3	0	0	**4**	
3	ECC 123	Basic Electronics	FC(BE)	3	0	1	**4**	
4	CSC 124	Object Oriented Programming using C++	FC(CS)	3	0	1	**4**	
5	HSC125	Environmental Studies	FC(HS)	4	0	0	4	
6	CSL 126	Object Oriented Programming using C++ Lab.	FC(CS)	0	3	0	**2**	
7	ECL 127	Basic Electronics Lab.	FC(BE)	0	3	0	**2**	
8	EDC 128	Engineering Graphics	FC(BE)	0	3	0	**2**	
						Total Credit:	**26**	

	Semester – III							
S.No.	Course Code	**Course Title**	**Category**	**L**	**P**	**T**	**Credits**	**Remarks**
1	MAC 211	Mathematics-III	FC(BS)	4	0	0	4	
2	ECC 212	Data Communication	PC(CE)	4	0	0	4	
3	CSC 213	Data Structures with C	PC(CE)	4	0	0	4	
4	ECC 214	Digital Circuits and Systems	FC(BE)	4	0	0	4	
5	CSC 215	Computer Organization and Architecture	PC(CE)	4	0	0	4	
6	CSL 216	Data Structures with C Lab.	PC(CE)	0	3	0	2	
7	ECL 217	Digital Circuit Lab.	FC(BE)	0	3	0	2	
8	CSL 218	Computer Engineering Workshop	PC(CE)	1	2	0	2	
						Total Credit:	**26**	

	Semester – IV							
S.No.	Course Code	**Course Title**	**Category**	**L**	**P**	**T**	**Credits**	**Remarks**
1	MAC 221	Mathematics-IV	FC(BS)	4	0	0	4	
2	ECC 222	Microprocessor& Microcontroller	FC(BE)	3	0	0	4	
3	CSC 223	Programming with Java	PC(CE)	3	0	1	4	
4	CSC 224	Analysis and Design of	PC(CE)	3	0	0	4	

		Algorithms						
5	CSC 225	Operating Systems	PC(CE)	3	0	0	4	
6	ECL 226	Microprocessor& Microcontroller Lab.	FC(BE)	0	3	0	2	
7	CSL 227	Programming with Java Lab.	PC(CE)	0	3	0	2	
8	CSL 228	Analysis and Design of Algorithms Lab.	PC(CE)	0	3	0	2	
						Total Credit:	**26**	

	Semester – V							
S.No.	Course Code	**Course Title**	**Category**	**L**	**P**	**T**	**Credits**	**Remarks**
1	MAC 311	Discrete Mathematics	FC (BS)	4	0	0	**4**	
2	CSC 312	Theory of Computation	PC(CE)	4	0	0	**4**	
3	CSC 313	Database Management Systems	PC(CE)	3	0	1	**4**	
4	CSC 314	Computer Networks	PC(CE)	3	0	0	**4**	
5	XXX XXX	HSS Elective-I	OE (OE)	3	0	1	**3**	
6	CSL 315	Database Management System Lab.	PC(CE)	0	3	0	**2**	
7	CSL 316	Computer Network Lab	PC(CE)	0	3	0	**2**	
8	CSL 317	Open Source Lab.	PC(CE)	0	3	0	2	
						Total Credit:	**25**	

	Semester – VI							
S.No.	Corse Code	**Course Title**	**Category**	**L**	**P**	**T**	**Credits**	**Remarks**
1	CSC 321	Artificial Intelligence	PC(CE)	4	0	0	**4**	
2	CSC 322	Web Technology	PC(CE)	3	0	1	**4**	
3	CSC 323	Software Engineering	PC (CE)	3	0	1	**4**	
4	XXX XXX	Programme Elective-I	PE (CE)	4	0	0	**4**	
5	XXX XXX	Open Elective-I	IE (IE)	4	0	0	**4**	
6	CSL 324	Web Technology Lab.	PC(CE)	0	3	0	**2**	
7	CSL 325	Software Engineering Lab.	PC(CE)	0	3	0	**2**	
						Total Credit:	**24**	

	Semester – VII							
S. No.	Course Code	**Course Title**	**Category**	**L**	**P**	**T**	**Credits**	**Remarks**
1	CSC 411	Data Warehouse and Data Mining	PC(CE)	4	0	0	**4**	
2	CSC 412	Compiler Design	PC(CE)	4	0	0	**4**	
3	XXX XXX	Programme Elective-II	PE (CE)	3	0	0	**4**	
4	XXX XXX	Open Elective-II	PE (CE)	3	0	0	**4**	
5	XXX XXX	HSS Elective-II	OE (OE)	3	0	0	**3**	
6	CSP 413	Minor Project	PP (PW)	3	0	0	**4**	
7	CSS 414	Technical Seminar	PP (TS)	0	0	0	**1**	
						Total Credit:	**24**	

	Semester – VIII							
S.No.	Course Code	**Course Title**	**Category**	**L**	**P**	**T**	**Credits**	**Remarks**
1	CSC 421	Cryptography and Network Security	PC(CE)	4	0	0	**4**	
2	XXX XXX	Programme Elective-III	PE (CE)	3	0	0	**4**	
3	XXX XXX	Programme Elective-IV	PE (CE)	3	0	0	**4**	

4	XXX XXX	HSS Elective-III	OE(OE)	4	0	1	**3**	
5	CSP 422	Major Project	PP (PW)	0	0	0	**8**	
6	CSV 423	Comprehensive Viva-voce	PP (CV)	0	0	0	**3**	
						Total Credit:	**26**	

SEMESTER WISE CREDIT DISTRIBUTION									
Year	**Credit(50)**		**Credit(52)**		**Credit(52)**		**Credit(50)**		
Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**TOTAL**
Total Credit	25	26	26	26	25	27	24	26	205

HSS ELECTIVES

HSS Elective-I

Code	Course Title	Category	L	P	T	Credits
HSE E01	Engineering Economics	OE(IE)	3	0	0	3
HSE E02	Profession Writing and Communication	OE(OE)	3	0	0	3
HSE E03	Science and Technology	OE(OE)	3	0	0	3

HSS Elective-II

Code	Course Title	Category	L	P	T	Credits
HSE E04	Organizational Behavior	OE(OE)	3	0	0	3
HSE E05	Personal Development	OE(OE)	3	0	0	3
HSE E06	Ethics Integrity and attitude	OE(OE)	3	0	0	3
HSE E07	E-Commerce	IE(IE)	3	0	0	3

HSS Elective-III

HSE E08	Entrepreneurial Management	OE(OE)	3	0	0	3
HSE E09	Human Resource Management	OE(OE)	3	0	0	3
HSE E10	Society and Social issues	OE(OE)	3	0	0	3
HSE E11	Law for Engineers	IE(IE)	3	0	0	3

OPEN ELECTIVES

Open Elective-I

Code	Course Title	Category	L	P	T	Credits
OPE E01	Principle of Programming Language	IE(IE)	4	0	0	4
OPE E02	Optimization Techniques	IE(IE)	4	0	0	4
OPE E03	Statistical Methods	IE(IE)	4	0	0	4
OPE E04	Digital Signal Processing	IE(IE)	4	0	0	4
OPE E05	Computer Oriented Numerical Methods	IE(IE)	4	0	0	4
OPE E06	Middleware Technologies	IE(IE)	4	0	0	4

Open Elective-II

Code	Course Title	Category	L	P	T	Credits
OPE E07	Information Theory and Coding	IE(IE)	3	0	0	4
OPE E08	VLSI Engineering	IE(IE)	3	0	0	4
OPE E09	Software Project Management	IE(IE)	3	0	0	4
OPE E10	Digital Image Processing	IE(IE)	4	0	0	4
OPE E11	Pattern Recognition	IE(IE)	3	0	0	4
OPE E12	Wireless Sensor Network	IE(IE)	3	0	0	4
OPE E13	Remote Sensing and Geographic Information Systems	IE(IE)	3	0	0	4

PROGRAMME ELECTIVES

Programme Elective-I

Code	Course Title	Category	L	P	T	Credits
CSE E01	Advanced Computer Architecture	PE(PE)	4	0	0	4
CSE E02	Soft Computing	PE(PE)	4	0	0	4
CSE E03	Semantic Web	PE(PE)	4	0	0	4
CSE E04	Cloud Computing	PE(PE)	4	0	0	4
CSE E05	Human Computer Interaction	PE(PE)	4	0	0	4
CSE E06	Advanced Data Structures	PE(PE)	4	0	0	4
CSE E07	Object Oriented Analysis and Design	PE(PE)	4	0	0	4
Programme Elective-II						
Code	Course Title	Category	L	P	T	Credits
CSE E08	Distributed Database Systems	PE(PE)	4	0	0	4
CSE E09	Information Retrieval System	PE(PE)	4	0	0	**4**
CSE E10	Embedded Systems	PE(PE)	4	0	0	4
CSE E11	Computer Graphics	PE(PE)	4	0	0	4
CSE E12	High Performance Computing	PE(PE)	4	0	0	4
CSE E13	Wireless Communications	PE(PE)	4	0	0	4
CSE E14	Mobile Computing	PE(PE)	4	0	0	4
Programme Elective-III						
Code	Course Title	Category	L	P	T	Credits
CSE E15	Parallel Computing	PE(PE)	4	0	0	4
CSE E16	Grid Computing	PE(PE)	4	0	0	4
CSE E17	Big data analytics	PE(PE)	4	0	0	4
CSE E18	Simulation and Modeling	PE(PE)	4	0	0	4
CSE E19	Introduction to Bioinformatics	PE(PE)	4	0	0	4
CSE E20	Internet of Things	PE(PE)	4	0	0	4
CSE E21	Management Information Systems	PE(PE)	4	0	0	4
Programme Elective-IV						
Code	Course Title	Category	L	P	T	Credits
CSE E22	Machine Learning	PE(PE)	4	0	0	4
CSE E23	Advanced Software Engineering	PE(PE)	4	0	0	4
CSE E24	Network Management	PE(PE)	4	0	0	4
CSE E25	Distributed Systems	PE(PE)	4	0	0	4
CSE E26	Software Design and Validations	PE(PE)	4	0	0	4
CSE E27	Storage Area Networks	PE(PE)	4	0	0	4
CSE E28	Ethical Hacking	PE(PE)	4	0	0	4
CSE E29	Game Programming	PE(PE)	4	0	0	4
CSE E29	Real time Systems	PE(PE)	4	0	0	4

NB:

Examination and Evaluation procedure for Technical Seminar, summer internship, Comprehensive Viva-Voce and Project Work (minor & Major) will be as per Academic & Examination Guidelines of SUIIT.

Semester-I

MATHEMATICS - I

Category: Foundation Course

Prerequisite: Calculus and basic Fundaments (Intermediate Mathematics)

LearningObjective: To provide the background mathematics and to analyze the structure of different shapes for application of subsequent CSE courses in mathematically oriented topics. Engineering applications are introduced in the relevant topics.The concept of Vector differentiation and integration that finds applications in various fields like solid mechanics, fluid flow, heat problems and potential theory.

Learning Outcome: Use various types of Series to test the convergence and divergence.
Apply the principles of Differential Calculus to solve a variety of practical problems in Engineering and Applied Science
Apply the principles of integrations to find length, Area, Volume of different curve, Region and solid.
To calculate the gradients and directional derivatives of functions of several variables.To use Green's theorem to evaluate line integrals along simple closed contours on the plane, Stokes' theorem to give a physical interpretation of the curl of a vector field and the divergence theorem to give a physical interpretation of the divergence of a vector field.
Apply the principles of Differential Calculus to solve a variety of practical problems in Engineering and Applied Science.

UNIT – I: SEQUENCES-SERIES(12 Hours)

Basic definitions of Sequences and series – Convergence and divergence – Ratio test – Comparison test – Integral test- Cauchy's root test- Raabe's test – Absolute and Conditional Convergence.

UNIT – II: FUNCTIONS OF SINGLE VARIABLE & APPLICATION (12 Hours)

Rolle's Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem-Generalized Mean value theorem (all theorems with proof) Functions of several variables – Functional dependence - Jacobian – Maxima and Minima of functions of two variables with constraints and without constraints. Radius, center and Circle of Curvature - Evolutes and Envelops - Curve tracing – Cartesian, polar and parametric curves.

UNIT – III: INTEGRATION(12 Hours)

Riemann Sums, Integral Representation for lengths, Areas, Volumes and Surface area in Cartesian and polar coordinates. Multiple integrals – double and triple integrals – change of order of integration – change of variable. The Euler-Lagrange Equation.

UNIT – IV:VECTOR CALCULUS (12 Hours)

Vector calculus: Gradient – Divergence – Curl and their related properties Potential function – Laplacian and second order operators. Line integral - - work done – Surface integrals – Flux of a vector valued Function. Vector integrals theorems: Green's – Stocke's and Gauss's Divergence Theorems (Statement and their Verifications).

TEXT BOOKS:

1. Advance Engineering Mathematics by Jain and S.R.K. Iyengar, Narosa Publications.

2. Calculus of Variations with Applications to Physics and Engineering by Robert Weinstock (Soft Copy Dover)

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, EriwinKreyszig's 8th Edition.Wiley Indian Publisher.
2.Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill)
3. Higher Engineering Mathematics - B.S. Grewal, Khanna Publications.

PHYSICS-I

Category: Foundation Course

Prerequisites: Basic Physics and Mathematics at intermediate level.

Learning Objectives:

- To teach the students about basic concepts of measurement, errors, relativity, mechanical and optical properties of waves, electricity, magnetism and superconductivity.

Learning Outcomes:

This course was designed so as students could be familiar with the measurement and errors of physical parameters, mechanical and optical properties of the waves, concepts of electricity and magnetism which are building blocks of communications.

UNIT – I:MEASUREMENTS, ERRORS, SPECIAL THEORY OF RELATIVITY (10 Hours)

Errors - types and sources of errors, Galilean transformation equations, concept of ether, Michelson-Morley Experiment, Einstein's postulates, Lorentz transformation equations, length contraction, time dilation, simultaneity in relativity, addition of velocity, variation of mass with velocity, mass- energy relation, energy-momentum relation.

UNIT – II:WAVES AND OSCILLATIONS (10 Hours)

Simple harmonic motion (SHM), superposition of two linear SHM's (with same frequency) Lissajous' figures, damped vibrations (differential equation and its solution), critical damping, forced vibration, amplitude and velocity resonance, sharpness of resonance and quality factor.Ultrasonics –Production of ultrasonics by Piezo-electric and magnetostriction, applications.

UNIT – III:WAVE OPTICS (10 Hours)

Interference, intensity distributions in interference, Fringe position and fringe width, thin film interference (uniform thickness), Newton's ring, Fraunhoffer Diffraction (single slit and grating), Polarization, double refraction, wave plates, Production of plane, elliptical and circular polarized light, Optical rotation, Polarizer.

UNIT – IV: ELECTRICITY, MAGNETISM and SUPERCONDUCTIVITY (10Hours)

Electricity- Coloumb's law, electric field and potential due to continuous charge distribution, Gauss's law of electrostatics and its application, Faraday's law, dipole, polar and non-polar molecules, Polarization vector, polarizability, dielectrics and dielectric constant, electric susceptibility, Lorentz local field, Claussius-Mossotti equation.

Magnetism- Lorentz force, Biot-Savart law and its application, Ampere's law and its applications, Divergence and Curl of magnetic field, Magnetic potential.

Superconductivity- Zero resistance, Critical temperature T_c, Perfect diamagnetism, Meissner effect, Critical field Hc, Type I and Type II superconductors

TEXT BOOKS

1. R. Murughessan, Modern Physics
2. Subramanyam&BrijLal, optics
3. Subramanyam&BrijLal, R.N. Choudhary, waves & vibrations
4. K.K. Tiwari, Electricity & Magnetism

BASIC ELECTRICAL ENGINEERING

Category:	Foundation Course
Prerequisite:	Na
Learning Objective:	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context. Provide working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices. Develop selection skill to identify the type of generators or motors required for particular application. Highlight the importance of transformers in transmission and distribution of electric power. Emphasize the effects of electric shock and precautionary measures. • Improve the ability to function on multi-disciplinary teams.
Learning Outcome:	This course enables us to understand the concepts of basic electoral engineering and its applications.

UNIT-I (10 HOURS)

DC Networks: Kirchhoff's laws, node and mesh analysis, Delta-star and star-delta transformations. Superposition, Thevenin and Norton's theorem.Transients, in R-L, R-C and R-L-C circuits with DC Excitation. Single Phase AC Circuits: Single phase EMF generation, average and effective values of sinusoids, j operations, complex representation of impedances, phasor diagrams, power factor, power in complex notation, solution of series and parallel circuits. Introduction to resonance in series RLC circuit. Three Phase AC Circuit: Three phase EMF generation, delta and star connection, Line and Phase quantities. Solutions of 3-phase circuits with balanced load.Power in 3-phase balanced circuits.

UNIT-II (10 HOURS)

Magnetic Circuits: B-H Curve, Hysteresis, Permeability and reluctance, solution of simple magneticcircuits, Hysteresis and Eddy current losses.
DC Generator: Different types, Principle of Operation of DC generator, EMF equation, Types of generator and methods of excitation. DC Motor: Back e.m.f., speed and torque of a DC Motor, Conditions for maximum Power. Speed control of DC shunt motor.
Transformers: Construction and Principle of operation of single-phase transformer, EMF equation, Single-phase autotransformer.

UNIT-III (10 HOURS)

Three phase Induction Motor: Construction and principle of operation, types; Slip-torque characteristics. Synchronous Machines: Construction & principle of operation of Synchronous generator and motor. EMF equation, Voltage regulation, Applications and starting of

Synchronous motor.Introduction to single phase induction Motor.

UNIT-IV (10 HOURS)

Measuring Instruments: DC PMMC instruments, Extension of range by shunts and multipliers. Moving iron ammeters and voltmeters, Dynamometer type Watt meters, Induction type Energy Meter. Power supply systems: Principle of generation - Thermal, Hydro and Nuclear power station, Transmission and distribution of electric energy.

TEXT BOOK

1. Edward Hughes (revised by Ian McKenzie Smith). "Electrical & Electronics Technology" Pearson Education Limited. Indian Reprint 2002.

REFERENCE BOOKS

1. H.Cotton, "Advanced Electrical Technology", CBS Publishers, New Delhi, 7 Edition.
2. C.L. Wadhwa, "Electrical Engineering", New Age International Publishers.
3. D.Kulshreshtha, " Basic Electrical Engineering" TMH
4. B L Thereja, "Electrical Technology", S Chand Publishers.

PROGRAMMING WITH C

Category: Foundation Course

Prerequisites: Na

Learning Objectives: To understand the various steps in Program development.

- To understand the basic concepts in C Programming Language.
- To learn how to write modular and readable C Programs
- To learn to write programs (using structured programming approach) in C to solve problems.
- To make the student understand simple sorting and searching methods.

Learning Outcomes: Demonstrate the basic knowledge of computer hardware and software.
Ability to apply solving and logical skills to programming in C language and also in other languages.

UNIT-I (10 hours)

Computer Fundamentals and Introduction to C : Role of computer and programming languages, compiler, interpreter, loader and linker, classification of programming languages, structured programming, concepts, algorithms and flowcharts.

Basics of C: Developing programs in C, a simple C program, structure of a C program, concept of a variable, data types in C, variables, program statement, declaration. All tokens, literals, operators and expressions, type conversions in C. Non-formatted input and output, formatted input and output.

UNIT- II(10 Hours) Control Statements: Introduction, conditional execution (if, if-else, nested if), selection (switch), unconditional types (break, continue, goto).Loops: Iteration and repetitive execution (for, while, do-while) nested loops. Arrays and Strings: Introduction, definition, one dimensional array, two dimensional arrays, accessing elements and storing elements.String-Introduction, C characters and strings, character handling library, string conversion functions, standard input output library functions, comparison functions of string handling, string manipulation functions, search and memory functions of string handling library.

UNIT- III(10 hours) Functions:Designing structured programs, functions, basics, parameter passing,call by value and call by reference mechanism to working with functions-example programs, storage classes- extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions andpassing arrays to functions.Dynamic memory allocation.

Pointers:Introduction, Pointer variable definition and initialization,void pointer, null pointer, use of pointers, pointer operators, pointer to a pointer, const keyword, constant pointer and pointer to a constant.Relationship between pointer and array, array of pointers and pointers to array.

UNIT-IV (10 hours)

Structures: Declaring structures and structure variables, accessing members of a structure, arrays of structures, arrays within a structure.structures and functions, pointers to structures.Union: Declaring union and its members, accessing and initializing members of a union, structure versus union.

Input and output - concept of a file,opening a file, closing a file; Working with text files, reading from and writing into text files,error handling and C program examples.

Text Book:

1. PradipDey and ManasGhosh, Programming in C, 2/e, Oxford University Press, 2013.
2. A Structured Programming Approach Using C, B.A. Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.

References:

1. R.S.Bichkar, Programming in C, University Press (India) Pvt. Ltd., 2012.
2. K.R.Venugopal and S.K.Prasad, Mastering C, McGraw Hill, 2009.
3. B.A.Forouzan and R.F.Gilberg, Computer Science: A Structured Programming Approach using C, 3/e, Cengage Learning.
4. E.Balaguruswamy, Programming in ANSI C, 6/e, McGraw Hill.
5. Ashok N. Kamthane, Programming with ANSI and Turbo C, Pearson Education, India.

Course Name: **ENGLISH FOR COMMUNICATION**

Category: Foundation Course

Prerequisite: Na

Learning Objective: To facilitate computer-aided multi-media instruction enabling individualized and independent language learning
To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking
To improve the fluency in spoken English and neutralize mother tongue influence
To train students to use language appropriately for interviews, group discussion and public speaking

Learning Outcome: Better Understanding of nuances of language through audio- visual experience and group activities
Neutralization of accent for intelligibility
Speaking with clarity and confidence thereby enhancing employability skills of the students

UNIT – I: (10 Hours)

Features of Indian English – Correction of sentences- Structures-Tenses-ambiguity-Idiomatic distortions.Informal conversation vs. Formal expression Verbal and non-verbal communication, barriers to effective communication–kinesics

UNIT – II: (10 Hours)

Types of Communication - Oral, aural, Writing and reading - Word-Power -Vocabulary-Jargon-rate of speech, pitch, tone - Clarity of voice Technical presentations-types of presentation–video conferencing--participation inmeetings- chairing sessions.

UNIT – III: (10 Hours)

Formal and informal interviews–ambiance and polemics-interviewing indifferent settings and for different purposes e.g., eliciting and giving information, recruiting, performance appraisal.

Written communication - differences between spoken and written communication – features of effective writing such as clarity, brevity, appropriate tone clarity, balance etc.-GRE.TOEFL models.

UNIT – IV:(10 Hours)

Letter-writing-business letters– proforma culture – format – style– effectiveness, promptness-Analysis of sample letters collected from industry-email, fax.

TechnicalReportwriting-BusinessandTechnicalReports–Typesofreports-progressreports, outline reports – Annual reports – format –analysis of sample reports from industry -Synopsis and thesis writing

TEXT BOOKS:

1. Essentials of Business Communication, Rajendra Pal, J S Korlaha : Sultan Chand& Sons
2. Basic Communication Skills for Technology, Andrea J. Rutherford : Pearson Education
3. Advanced Communication Skills, V. Prasad, Atma Ram Publications, New Delhi.

REFERENCE BOOKS:

1. Raymond V. Lesikav; John D. Pettit Jr., Business Communication, Theory& Application, All India Traveler Bookseller.
2 Business Communication, RK Madhukar, Vikas Publishing House Pvt. Ltd
3 Edmond H Weiss: Writing Remedies: Practical Exercises for Technical Writing, Universities Press,
4 Cliffs Test Preparation for GRE and TOEFL: Computer Based Test, IDG Books. India(P) Ltd..
5 GRE and TOEFL; Kaplan and Baron's English in Mind, Herbert Puchta and Jeff Stranks, Cambridge

BASIC ELECTRICAL ENGINEERING LAB

List of Experiments:

1. Preliminary: Preparation of symbol chart for various systems & components as per ISS, To study the constructional & operational features for Voltmeter, Ammeter, Wattmeter, Frequency meter, multi-meter and Rheostat, Study of safety rules as per ISS.
2. Measurement of the armature & field resistance of D.C. Machine by volt-amp method. &Starting and speed control of a D.C. shunt motor
3. Study of B-H Curve 4. Determination of open circuit characteristics (O.C.C) of D.C shunt generator when separately excited at different speeds.
5. Measurement of earth resistance and insulation resistance
6. Starting of Induction motor and measurement of three phase power & power factor by 2- wattmeter method.
7. Calibration of a single phase Energy Meter by directed loading.

PROGRAMMING IN C LAB.

List of topics for writing C-programs:

1. Print statements, variables and simple arithmetic operations, mathematical series…etc.
2. Conditional statements (if, if…else, if…else if…else, switch case statement)
3. Loops : (while(…){…}, do{…}while(…), for(…,…,…){}). Some other experiments related to like printing a pattern on the screen…etc.
4. Arrays : One dimensional, multi directional.
5. Strings
6. Pointers
7. User defined Functions
8. Structures and Unions
9. Files : Various operations on Text, Binary Files
10. Command Line Arguments
11. Sorting and Searching algorithms: Basic searching and sorting techniques on linear array.

The above Lab. exercises to be carried out in 45 Hours (15 Lab. Classes).

THE PHYSICS LAB

Following Experiments have to be conducted –

1. To determine acceleration due to gravity of earth using compound pendulum.
2. To determine moment of inertia of fly wheel.
3. To study power resonance in series and parallel LCR circuit.
4. To determine refractive index and dispersive power of material of prism.
5. To verify Faraday's electromagnetic induction law.
6. To determine slit width using laser diffraction.
7. To calculate horizontal component of earth magnetic field with the help of tangent galvanometer.
8. To determine wavelength of source light using Newton's ring experiment.

Text book:

1. Physics Practical book, P.K. Verma
2. Physics Practical book, Agrawal, Jain & Sharma

Semester-II

MATHEMATICS II

Category:	Foundation Course (Basic Science : Mathematics)
Prerequisite:	Basic knowledge in Calculus
Learning Objective:	The objective of the course is To introduce the concepts of differential equations and the transformations required in modeling of dynamical and discrete systems in nature. To propose the solution schemes for a detailed investigation of the system.
Learning Outcome:	This course helps the students to analyze the different systems in nature which are in motion of continuous and in discrete type.

UNIT – I: Differential Equation of First Order and Higher order linear DE(12 hours)
Overview of Differential equations – homogeneous, exact, linear and Bernoulli. Application to Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories and Geometrical Applications. Linear differential equation of second order and higher order with constant coefficients. RHS term of the type $f(x) = e^{ax}$, sin ax, cosax ,$e^{ax}V(x)$, $X^nV(x)$, method of variation of parameters. Applications to bending of beams, Electrical circuits, Simple harmonic motion, Partial differential equation: Heat, Laplace & wave equation.

UNIT – II: Laplace Transform and Application to ODE(12 hours)
Laplace transform of standard functions – Inverse transform – first Shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second Shifting theorem – Dirac's delta function – Convolution theorem – Periodic function – Differentiation and integration of transforms- Application of Laplace transforms to ordinary differential equations.

UNIT – III: Difference equation & Z –transform (12 hours)
Introduction to difference equation and its applications in Engineering. Z – Transform – inverse Z –transform – properties – Damping rule – Shifting rule (left, right) – Initial and Final value theorems. Convolution theorem – solution of difference equation by z – transforms

UNIT – IV: Fourier Series and Fourier transform (12 hours)
Fourier Series: determination of Fourier coefficients – Fourier series – even an odd functions. Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – properties – inverse transform - Finite Fourier transforms.

TEXT BOOKS

1. Advance Engineering Mathematics by Jain and S.R.K. Iyengar, Narosa Publications.

REFERENCE BOOKS:

1.Advanced Engineering Mathematics, EriwinKreyszig's 8th Edition. Wiley Indian Publisher.
2.Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill)
3. Higher Engineering Mathematics - B.S. Grewal, Khanna Publications.

PHYSICS-II

Category: Foundation Course

Prerequisite: Basic concepts of differentiation and integration, vectors and their properties, electrostatics and magnetism.

Learning Objective: To teach the students modern physics like quantum mechanics, LASER and Fiber Optics, material science etc.

Learning Outcome: This course was designed so as students could be familiar with the nature of electromagnetic waves and their various properties in different media, wave-matter duality and its equations, Laser and optical fibres and their applications.

UNIT – I:VECTOR CALCULUS & ELECTROMAGNETIC FIELD THEORY(10 Hours)

Vector Calculus- Del operator, gradient of a scalar field, divergence and curl of a vector fields, significance of gradient, divergence and curl, line integral, surface integral, volume integral, Gauss divergence and Stoke's theorems.

Electromagnetic Theory - Integral and differential forms of Gauss's laws for electrostatics and magnetism, Faraday's law of electromagnetic inductions, Ampere's circuital law, equation of continuity, modified Ampere's law (Maxwell-Ampere's law), concept of displacement current, Maxwell's equations (general form and in charge free space), Electromagnetic wave in charge free space and its solutions, wave impedance.

UNIT – II: QUANTUM MECHANICS (10Hours)

Planck's hypothesis, de Broglie matter waves, derivation of wavelength of matter wave in different forms, Heisenberg's uncertainty principle and its applications, Phase velocity and group velocity, Schrödinger wave equation (time independent and dependent) and its applications (particle in one dimensional box, tunneling effect etc.), Born's interpretation of wave equation, normalization of wave equation.

UNIT – III:THERMODYNAMICS AND STATISTICAL MECHANICS (10 Hours)

Thermodynamics- Thermodynamic systems, work done, several processes, laws of thermodynamics, concept of temperature, entropy, reversible and irreversible process, thermodynamic potentials and Maxwell relations, latent heat equation.

Statistical Mechanics- Macro and microstates, phase space, Maxwell-Boltzmann distribution, Bose-Einstein and Fermi-Dirac distributions, Partition function, statistical entropy and temperature, relation between thermodynamics and statistical parameters.

UNIT – IV:LASER AND FIBER OPTICS (10 Hours)

Laser- Absorption, spontaneous and stimulated emission of light, Einstein A and B coefficients, pumping, metastable state, population inversion, resonant cavity, lasing action, three and four level lasers, types of lasers (Ruby, He-Ne, Nd-YAG, semiconductor), properties and applications of laser.

Fiber Optics- Introduction, total internal reflection, numerical aperture and various fiber parameters, step index and graded index fibers, mode of propagation, single mode and multimode fibers, application and losses of optical fiber.

TEXT BOOKS:

1. D.J. Griffith, Mathew N O Sadiku, Principles of electromagnetic

2. K.R. Nambier, B.B. Laud, Laser and non-linear optics
3. D.J. Griffith, SatyaPrakash, Quantum Mechanics
4. S.K. Roy, Thermal Physics & Statistical Mechanics

BASIC ELECTRONICS

Category: Foundation Course
Prerequisite: Basics of semiconductor Physics.
Learning Objective: To learn fundamentals of diodes, BJTs,FETs, and use of BJTs & FETs in design of amplifiers and oscillators.
Learning Outcome: Acquire working knowledge of diodes, BJTs,FETs,and design of amplifiers & oscillator.

UNIT – I: INTRODUCTION TO ELECTRONICS(10 hours)
Electronic devices and their applications, signals, analog & digital signals, amplifiers. Linear wave shaping circuits: RC LPF, Integrator, RC HPF, Differentiator. Properties of semiconductor classification of solid, energy band in si, intrinsic & extrinsic semiconductors, current flow in semiconductors, Hall effect, diffusion current, drift current, mobility & resistivity.
UNIT – II:SEMICONDUCTOR DIODES (10 hours)
p-n junction theory, V–I characteristics, load line analysis, equivalent circuit of diode, analysis of diode circuit, transition capacitance & diffusion capacitance. Application of diode circuit ; Rectifiers, clippers, clampers. Filter circuits, Special purpose diodes :zener diode, LED, Photo diode, tunnel diode, varactor diode, Shockley diode. Basics of LASER.
UNIT – III:BJTs AND FETs BJT (10 hours)
BJTs AND FETs BJT structure &operation , different transistor configurations & their characteristics, DC analysis of BJT, Field effect transistors (FETs) : Types, structure &operation of JFET and MOSFET, Depletion mode & enhancement mode MOSFET, Device characteristics,MOSFET as a switch.
UNIT – IV:FEEDBACK AMPLIFIERS & OSCILLATORS (10 hours)

General principles of feedback amplifier, .Oscillators : principles of oscillations, Barkhausen criteria for oscillation, types of oscillator circuits and their operations. Operational amplifiers (OP-AMPs)and applications : Ideal op-amp, inverting & non inverting amplifier, adder, integrator & differentiator. Active filters.

TEXT BOOKS:

1. Electronic Devices & Circuit Theory, R.L Boylestad and L. Nashelsky, Pearson Education
2. Electronics Fundamentals and Applications, D Chattopadhyay and P. C Rakshit, New Age International Publications.
3. Microelectronics Circuit:Theory and applications,Sedra and Smith,Oxford University Press.

REFERENCE BOOKS:
1. Integrated Electronics, Millman and Halkias, Mc. Graw Hill Publications.
2. Electronics Devices and Circuits, Sanjeev Gupta, DhanpatRai, Publications.
3. Digital Logic and Computer Design, Morris Mano, PHI, EEE.

Course Name: **OBJECT ORIENTED PROGRAMMING WITH C++**

Category: Foundation Course
Prerequisite: Basic knowledge of C

Program Objective: The Aim of the course is to acquaint the student with C++ and the applications of C++.

Learning Objectives: Understand and use the basic programming constructs of C/C++
Manipulate various C/C++ datatypes, such as arrays, strings and pointers
Apply object-oriented approaches to software problems in C++
Write small scale C++ programs using the above skills

UNIT- I(10 hours)

Introduction to OOP:Procedure oriented programming, object oriented programming, basic concepts of OOP, benefits and applications of OOP, simple C++ program,, namespace scope, structure of C++ Program, creating, compiling and linking a file.**Tokens:** Keywords, identifiers, constants, basic data types, user defined data types, storage classes, derived data types, dynamic initialization of variables, reference variables, operators in C++, scope resolution operator, member dereferencing operators, memory management operators.

UNIT- II (10 hours)

Control Structures, Classes and Objects: Specifying a class, defining member functions, C++ program with class, private member functions, arrays within class, memory allocation for objects, static data members, static member functions, arrays of objects, returning objects.Functions in C++: Main function, function prototyping, call by reference, return by reference, inline functions, default arguments.More about Functions: Function Overloading, friendly functions: friend function, a function friendly to two classes, objects as function arguments.

UNIT- III (10 hours)

Constructors and Destructors: Constructors, parameterized constructors, multiple constructors in a class, constructors with default arguments, copy constructors, dynamic constructors, destructors. Inheritance: Introduction to inheritance, single inheritance, making a private member inheritable (protected member), multi-level inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance.Operator Overloading: Rules for overloading operators, overloading unary operators, overloading binary operators.Pointers: Introduction to Pointers, declaring and initializing pointers, arithmetic operations on pointers, pointers with arrays, arrays of pointers, pointers to objects, 'this' pointer.

UNIT- IV (10 hours)

Polymorphism and Virtual Functions: Compile-time polymorphism, run-time polymorphism, virtual functions.Managing Console I/O Operations: Unformatted I/O operations, formatted console I/O operations (width ( ), precision( ), fill( ), managing output with manipulators(setw( ) , endl).Templates: Introduction, function templates, class templates. Exception Handling: Introduction, exception handling mechanism, throwing mechanism, catching mechanism.

Text Book:

1. E.Balaguruswamy, Object Oriented Programming with C++, 6/e, McGraw Hill, 2013.

References:

1. SouravSahay, Object Oriented Programming with C++, 2/e, Oxford University Press, 2012.
2. Behrouz A. Forouzan and Richard F. Gilberg, Computer Science: A Structured Approach using C++, 2/e, Cengage Learning, 2003.
3. Ashok N. Kamthane, Object Oriented Programming with ANSI and Turbo C++, 1/e, Pearson Education, 2006.

ENVIRONMENTAL STUDIES

Category: Foundation Course
Prerequisite: Na

Learning Objective: To understand concepts concept on environment and ecology, concept of population, community and biodiversity, concept on environmental problems and management strategies.

Learning Outcome: This course enables us to understand the concepts of environmental studies and its applications.

UNIT – I: Environment, Ecosystem and Biodiversity

Concept of environment and ecosystem, Different spheres of the Earth System.Structure and Function of an ecosystem.Producer, Consumers, Decomposers, Energy Flow in the Ecosystem.Ecological succession.Food Chains, Food Webs and Ecological Pyramids.Concept of Biodiversity and its value.Methods for Biodiversity Conservation.Biogeographic provinces.Hot-spots of biodiversity.

UNIT – II: Renewable and Non-Renewable Resources

Concept of Resource and Wastes, Different Values of Resources.Classification of Resources.Forest, Water, Land, Mineral, Food and Energy resources.Exploitation and Use of Resources and their effects on the environment and ecosystem.Principles and Methods of conservation of natural resources.

UNIT – III: StrategiesEnvironmental Pollution and Disasters

Concept of Contaminants, Pollutants, Pollution and Contamination. Threshold values for deciding pollution status. Pollution of Air, Water and Soil.Pollution due to Solid waste, E-Waste, Bio-Medical Wastes etc.Noise and Thermal PollutionOzone Layer Depletion.Global Warming.Acid Rain.Concept of disaster – Natural & Man-made disaster, Flood, Earthquake, Cyclones and Landslides.Nuclear Accidents.

UNIT – IV: Social Issues and the Environment

Population explosion its effects and programmes for its management. Unsustainable and Sustainable Developments.Water Conservation, Rain water harvesting, Watershed management.Environmental protection Act, Air Act, Water Act, E-Waste and Biomedical Wastes management and handling rules.

TEXT BOOKS:

1. Textbook of Environmental studies, ErachBharucha, UGC
2. Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd

REFERENCE BOOKS:

1. Dash, M.C. and Dash, S.P. (2009). Fundamentals of Ecology. Tata Mcgraw Hill Education Pvt. Ltd., New Delhi, p.562.
2. Arthur N. Strahler and Alan H. Strahler (1973). Environmental Geoscience, Hamilton Publishing Company, Santa Barbara, California.
3. Garg, S.K. (2010). Ecology and Environmental Studies for Environmental Science and Engineering, Khanna Publishers, New Delhi, p.712
4. Trivedi, R.K. and Goel, P.K. (2012). An Introduction to Air pollution, B.S. Publications, Hyderabad, p.284.
5. Rajagopalan R.(2009). Environment and Ecology, UPTU. P.232
6. Rajagopalan R.(2011). Environmental Studies: From Crisis to Cure

OBJECT ORIENTED PROGRAMMING USING C++ LAB CS 1202

List of topics:

1. Data types & variables.

2. Decision control structures: if, nested if etc.
3. Program with loop control structures: do, while, for etc.
4. Inheritance, polymorphism, packages, generics.
5. Program with modern features of java.
6. Interfaces and Inner classes
7. Implementing wrapper classes
8. Implementing generics.
9. Working with files.

The above Lab. exercises to be carried out in 45 Hours (15 Lab. Classes).

BASIC ELECTRONICS LAB BE 1202

Experiment List

1. To Study the VI characteristics of PN Junction Diode in forward and reverse bias.
2. To Study the VI characteristics of Light Emitting Diode.
3. To Study the VI characteristics of Zener Diode in reverse bias.
4. To Study the Half Wave Rectifier with filter.
5. To Study the Full Wave Rectifier with filter.
6. To Study Zener Diode as Voltage Regulator.
7. To Study Diode Clipper Circuit.
8. Positive Clipper
9. Negative Clipper
10. Positive Biased Clipper
11. To Study Diode Clamper Circuit.
12. Positive Clamper
13. Negative Clamper
14. Positive Biased Clamper
15. To Study the Voltage Regulator using IC LM7805 and LM7809.
16. To Study Transistor Input Characteristics in Common Emitter Configuration.
17. To Study Transistor Output Characteristics in Common Emitter Configuration

ENGINEERING GRAPHICS

Prerequisites: Lab to be carried out using FreeCAD

Objective: The objective of this Course is to provide the basic knowledge about Engineering Drawing.Detailed concepts are given in projections, technical drawing, dimensioning andspecifications using FreeCAD, so useful for a student in preparing for an engineering career.

UNIT – I: Introduction to Engineering Drawing&FreeCAD

Principles of Engineering Graphicsand their significance, usage of FreeCAD toolboxes, lettering, Conic sections including theRectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute;Scales;

UNIT – II: Orthographic & Isometric Projections

Principles of Orthographic ProjectionsConventions- Projections of Points and lines inclined to both planes; Projections of planesinclined Planes - Auxiliary Planes

Principles of Isometric projection – IsometricScale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple andcompound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa,Conventions;

UNIT – III: Projections of Regular Solids&Sections and Sectional Views of Right Angular Solids

Inclined to both the Planes- AuxiliaryViews

Prism, Cylinder,Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism,Pyramid, Cylinder and Cone

TEXT BOOKS:

1. Daniel Falck& Brad Collette (2008), FreeCAD How To, Packt Publishing
2. Bhat, N.D.& M. Panchal (2008), Engineering Drawing, Charotar Publishing House

REFERENCE BOOKS:

1. Shah, M.B. & B.C. Rana (2008), Engineering Drawing and Computer Graphics, Pearson Education
2. Dhawan, R.K. (2007), A Text Book of Engineering Drawing, S. Chand Publications
3. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

Semester-III

MATHEMATICS III

Category: Foundation Course (Basic Science : Mathematics)

Prerequisite: Basic Knowledge in Counting, permutation & combination, calculus, complex and real numbers.

Learning Objective:

1. To introduce the concept of probability and statistics and their implementation in real life situations.
2. To give a foundation of complex function and their approach to different types of series & integration.

Learning Outcome:

1. The probability models and statistical methods give a pro forma to analyze the data in various scientific disciplines which increase their research interests in a basic level.
2. The details of complex function theory give a smooth entry to many technical and bio engineering fields in an analytical way.

UNIT – I: Probability(12 Hours)

Probability: Sample space and events – The axioms of probability – some elementary theorems – conditional probability – Baye's theorem. Random variables – discrete and continuous distribution – distribution functions- Binomial, poison and Normal distribution- sampling distribution – population and samples – proportions, sums and differences.

UNIT – II: Statistics (12 Hours)

Estimations: Point estimation – interval estimation – Bayesian estimation. Testing of hypothesis: means – hypothesis concerning one or two means – Type I and Type II errors. One tail , tow-tail tests. Test of significance – student's t- test. F-test, test . Estimation of proportion.

UNIT – III: Complex Functions(12 Hours)

Functions of complex variable – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions – Milne – Thompson Method.

UNIT – IV: Complex integration(12 Hours)

Line integral – evaluation along path and by definite integration – Cauchy's integral theorem – Cauchy's integral formula – Taylor's series expansion- singularities (isolated , pole , essential) – Residues – evaluation of residue by Laurent series. Residue theorem. Evaluation of integrals of different type.

TEXT BOOKS

1. Introduction to Probability and Statistics by William Mendenhall ,Cengage learning.
2. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill)

REFERENCE BOOKS

1. Advanced Engineering Mathematics, EriwinKreyszig's 8th Edition. Wiley Indian Publisher.
2. Advance Engineering Mathematics by Jain and S.R.K. Iyengar, Narosa Publications

DATA COMMUNICATIONS

Category:	Foundation Course
Prerequisite:	Basic Computer Science.
Learning Objective:	To understand the building blocks of digital communication system. To prepare mathematical background for communication signal analysis. To understand and analyze the signal flow in a digital communication system. To analyze error performance of a digital communication system in presence of noise and other interferences
Learning Outcome:	This course enables us to understand the concepts of data communication.

UNIT –I: (12 Hours)

Analog Communication: Block diagram of Electrical communication system, Types of Amplitude modulation, AM, DSB SC, SSB SC,VSB, Power and BW requirements, Diode detector, Product demodulation for DSB SC & SSB SC. Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

UNIT –II: (12 Hours)

Pulse Modulations: Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM, Time Divison Multiplexing, Frequency Divison Multiplexing, Asynchronous Multiplexing.

UNIT –III: (12 Hours)

Digital Communication: Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison.

Digital Modulation:ASK, FSK, PSK, and DPSK, QPSK demodulation, coherent and non-coherent reception, Comparison of binary and quaternary modulation schemes, M-ary modulation techniques.

UNIT –IV: (12 Hours)

Protocol Architecture: Need for protocol architecture, TCP/IP protocol architecture, OSI model, TCP/IP Vs OSI model.

Information Theory and Coding: Discrete messages and information content, source coding, Shanon ‘s theorem, channel capacity, Block codes- coding and decoding, burst error correction(BRC), Convolutional coding, decoding convolutional code, comparison of error rates in coded and uncoded transmission, turbo codes.

TEXT BOOKS:

1. Communication Systems, Simon Haykin, John Wiley.
2. Principles of Communications – H. Taub and D. Schilling, Gouthamsaha, TMH.

REFERENCE BOOKS:

1. Communication Systems Analog and Digital – R.P. Singh and S D Sapre, TMH, 2nd Edition, 2008.
2. Digital and Analog Communication Systems – K Sam Shanmugam,WSE,2006.
3. Electronic &Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.
4. Modern Digital and Analog communication Systems – B.P Lathi, Oxford 3rd edition.

DATA STRUCTURE WITH C

Category:	Foundation Course
Prerequisite:	Concept of C programming, Basics of Computer Architecture (Primary a Secondary storage structure)

Learning Objective:	To get clear understanding about the basic data structures and their operations, the concepts of algorithms, basic search and sort algorithms. Student will also gain adequate knowledge to choose appropriate data structure and algorithm to solve a problem
Learning Outcome:	This course enables us to understand the concepts of data structure.

UNIT – I: INTRODUCTION, SORTING, AND SEARCHING TECHNIQUES(10 hours)

Introduction: Basic Terminology, Elementary Data Organization, Structure operations, Algorithm Complexity and Time-Space trade-off.

Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered List, Sparse Matrices and Vectors.

Searching: Sequential search, binary search, comparison and analysis.

Sorting: Insertion Sort, Bubble Sort, Quick Sort, Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting.

UNIT – II: LINEAR DATA STRUCTURES (10 hours)

Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push& Pop, Linked Representation of Stack, Operations Associated with Stacks, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack, Applications of recursion in problems like 'Tower of Hanoi.

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

Linked list: Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Polynomial representation and addition, Generalized linked list.

UNIT – III: NON-LINEAR DATA STRUCTURES (10 hours)

Trees: Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, Red-Black tree, B-trees.

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

UNIT – IV: HASHING AND FILE STRUCTURES(10 Hours)

Hashing: Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation

File Organization and Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B^+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.

TEXT BOOKS:

1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia.
2. Data Management and File Structures, Mary E.S. Loomis, PHI

REFERENCE BOOKS:

1. Richard F. Gilberg & Behrouz A. Forouzan, Data Structures: A pseudo code approach with C, CENGAGE Learning
2. A. M. Tenenbaum, "Data Structures using C & C++", PHI

3. Adam Drozdek, "Data Structures and Algorithms in C++", Thomson Asia Pvt.Ltd.(Singapore)

DIGITAL CIRCUIT AND SYSTEM

Category:	Foundation Course
Prerequisite:	Basic Electronics, Analog Electronics
Learning Objective:	To learn basics of digital electronics circuit.
Learning Outcome:	Acquired knowledge about the basics of logic gates, boolean algebra,combinatior and sequential circuits.

UNIT –I: (10 Hours)

Review of number system -binary, octal, decimal and hexadecimal number systems and conversions.1's complements, 2'complement, binary addition, subtraction, multiplication & division. Logic gates and boolean algebra: NAND & NOR Implementation, De Morgan's law, Duality theorem, Gate level Minimization. Digital Logic Gates for Multiple inputs. Boolean functions, Canonical & standard form; min terms & max term,. The Map Method, K Map for two, three, four variables. Product of Sum (POS), Sum of product (SOP) simplification, Don't care conditions.Error detection& correction: Parity Generator and Checker Circuit.

UNIT –II: (10 Hours)

Combinational Logic Circuits and Logic Families: Analysis & Design of Binary Half Adder & Full Adder circuit, CarryLookAheadadder. Half and Full-subtractor circuit, Decoders, Decoder for Seven segment display, decoder for binary to grey and grey to binary code. Encoders, Priority encoders, Multiplexers and Demultiplexers, Magnitude Comparator.Digital Integrated logic Circuits (Logic Families): RTL, DTL, TTL, ECL, MOS & C-MOS Logic circuits.,

UNIT –III: (10 Hours)

Sequential Logic Circuit : Sequential Circuit, Latches, Flip-flop (S-R, J-K,D,T,M/S), edge triggering and level triggering. Register &Counters: Universal Shift Register (SISO, SIPO, PISO, PIPO), Synchronous Counter, Ripple counter, Modulo-n Counter, Up-Down Counter, Asynchronous Counter, , Ring Counters. Analysis of Clocked Sequential circuits.Analog to digital converter (ADC) & Digital to analog converters (DAC).

UNIT –IV: (10 Hours)

Memory & Programmable Logic: Classification of memories–ROM, ROM organization, PROM, EPROM, EEPROM, EAPROM,RAM, RAMorganization. ProgrammableLogic Devices, Programmable LogicArrayy(PLA), ProgrammableArray Logic(PAL), Field ProgrammableGate Arrays(FPGA).

TEXT BOOKS:

1. Digital Design, 3rd edition by M. Morris Mano, PHI

REFERENCE BOOKS

1. Digital Fundamentals – Floyd & Jain, Pearson education
2. Digital Principles & Applications – Malvino, Leach & Saha, 6th Edition, Tata Mc Graw Hill
3. Switching Theory & Digital Electronics – V. K. Jain, Khanna Publishers

COMPUTER ORGANIZATION AND ARCHITECTURE

Category: Program Core Course
Prerequisites: Na
Course Objectives:

To understand how computers are constructed out of set of functional units.
To understand how these functional units operate, interact and communicate.
Understand the design of processors, the structure and operation of memory, pipelining, system integration and peripherals.
To understand the system interconnection and the different I/O techniques.

Course outcomes:

After this course students understand in a better way to design and interconnection of various modules of a system, the I/O and memory organization in depth.
Able to understand the basic components and the design of CPU, ALU and Contr**o**lUnit.
Ability to understand memory hierarchy and its impact on computer cost/performance.

UNIT- I(10 Hours)

Register Transfer and Micro operations: Register transfer language, register transfer, bus and memory transfers, arithmetic micro-operations, logic micro-operations, shift micro-operations, arithmetic logic shift unit.

UNIT- II(10 Hours)

Basic Computer Organization and Design: Instruction codes, Computer Registers,Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt, Complete Computer Description.
Micro Programmed Control: Control memory, Address sequencing, Micro program example, design of control unit

UNIT- III(10 Hours)

Central Processing Unit: Introduction, General register organization, Stack organization, Instruction formats, addressing modes, Data transfer and manipulation, Program control.
Pipeline and Vector Processing: Parallel processing, pipelining, arithmetic pipeline, Instruction pipeline. introduction to multiprocessors.
Computer Arithmetic: Introduction, addition and subtraction, decimal arithmetic unit, booth multiplication algorithm.

UNIT-IV(10 Hours)

Input/Output Organization:Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access (DMA).The Memory System: Memory Hierarchy, Auxiliary memory, Associative memory, Cache memories, cache memory techniques, Virtual memory

TEXT BOOKS:

1. M.Morris Mano, Computer System Architecture, 3/e, Pearson education, 2008.
2. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5/e, McGraw Hill, 2001.

REFERENCE BOOKS:

1. John P. Hayes, Computer Architecture and Organization, 3/e, McGraw Hill, 1998.
2. William Stallings, Computer Organization and Architecture, 6/e, Pearson, PHI, 2012.

DATA STRUCTURE WITH C LABCS 1203

1. Write a program tocreate an array dynamically, accept its members and sort the array using following sorting algorithm. Also count the total number of swaps.

a. Bubble sort

b. Selection sort
c. Insertion sort
d. Quick sort
e. Merge sort

2. Write a function search an element from the array using following searching techniques:

a. Linear search
b. Recursive linear search
c. Binary search
d. Recursive binary search
e. Ternary search

3. Write a structure for an integer stack, implement**push, pop, and peek, IsEmpty** and **IsFull** function. Write a main function and call the functions based on user's choice.

```
typedef struct stack
{
int top;
int data[max];
}Stack;
```

4. Write a structure for an integer queue, implement **enqueue, dequeue, and traverse, IsEmpty** and **IsFull** function. Write a main function and call the functions based on user's choice.

```
typedef struct queue
{
intfront,rear;
int data[max];
}Queue;
```

5. Write a program to implement queue using two stacks. Include mystack.h and do the program.
6. Write a structure for an integer circular queue, implement**enqueue, dequeue, and traverse, IsEmpty** and **IsFull** function. Write a main function and call the functions based on user's choice.

```
typedef struct circularQueue
{
intfront,rear;
int data[max];
}Queue;
```

7. Create a singly linked list of integers, write functions to add elements at different places (beginning, end, at a specified position), delete a node from different positions (beginning, end, at a specified position) and traverse the linked list based on user's choice.
8. Write a program to implement stack using linked list.
9. Write a program to implement Queue using linked list.
10. Create a singly circular linked list of integers, write functions to add elements at different places (beginning, end, at a specified position), delete a node from different positions (beginning, end, at a specified position) and traverse the linked list based on user's choice.
11. Create a doubly linked list of characters, write functions to add elements at different places (beginning, end, at a specified position), delete a node from different positions (beginning, end, at a specified position) and traverse the linked list in both directions based on user's choice.
12. Declare a binary search tree (BST) where information at each node would be a single integer. Write recursive and non recursive (use mystack.h) functions for

a. Inserting a key
b. Deleting a key from the tree.
c. Searching an element
d. Inorder , Preorder and Postorder traversal

e. Finding height of the tree
f. Count number of nodes
g. Display leaf nodes

13. Declare an AVL Tree where information at each node would be a single integer. Write recursive functions for

a. Inserting a key
b. Deleting a key from the tree.
c. Searching an element

14. Write a program to implement single threaded binary tree and perform the following functions.

a. Inserting a key
b. Deletion of a key
c. In-order traversal using the thread
d. Maximum depth of the tree

15. Write a program for Breadth First Traversal of a graph.
16. Write a program for Depth First Traversal of a graph.
17. Write a program to check whether there is a path between two vertices of graph.
18. Given a directed graph. Write a program to find shortest path among all the nodes of a graph using Floyd Warshall Algorithm.
19. Given an undirected, connected and weighted graph, find **M**inimum **S**panning **T**ree (MST) of the graph using Kruskal's Algorithm.
20. Given an undirected, connected and weighted graph, find **M**inimum **S**panning **T**ree (MST) of the graph using Prim's Algorithm.

DIGITAL CIRCUIT LAB BE 1203

Experiment Lists

1. Verification of Logic Gates.
2. Realization of Gates Using NAND Gate.
3. Realization of Gates Using NOR Gate.
4. Half and Full Adder using Gates.
5. Encoder / Decoder (4:2 / 2:4).
6. Multiplexer / De-multiplexer (2:1 / 1:2).
7. Flip-Flop (RS, T, D, JK).
8. BCD to Seven Segment Display.
9. Shift Register (2-Bit).
10. Counters

COMPUTER ENGINEERINGWORKSHOP CS 1301

PC HARDWARE

Week 1 - Task 1 : Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a viva. Also students need to go through the video which
shows the process of assembling a PC. A video would be given as part of the course content.
Week 2 - Task 2 : Every student should individually install MS windows / Linuxon the personal computer. Lab instructor should verify the installation and follow it up with a viva.
Week 3 - Task 3 : Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a viva

Week 4 - Task 4 : Several mini tasks would be that covers basic commands in linux and basic system administration in linux which includes: Basic linux commands in bash, create hard and symbolic links, text processing, using wildcards

Week 5 - Task 5 : Hardware Troubleshooting : Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to

working condition. The work done should be verified by the instructor and followed up with a Viva.

Week 6 - Task 6 : Software Troubleshooting : Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a viva.

INTERNET AND WORLD WIDE WEB

Week 7 - Task 1 : Orientation and Connectivity Boot Camp : Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should

22 demonstrate, to the instructor, how to access the websites and email. If

there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Week 8 - Task 2 : Web Browsers, Surfing the Web : Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Week 9 - Task 3 : Search Engines and Netiquette : Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors.

Week 10 - Task 4 : Cyber Hygiene : Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install an anti virus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and MS/equivalent (FOSS) tool Power Point

Week 11 - Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes : PPT orientation, slide layouts, insertingtext, word art, formatting text, bullets and numbering, auto shapes, lines and arrows in both LaTeX and powerpoint.

Week 12 - Task 2 : Second week helps students in making their presentations interactive. Topic covered during this week includes : Hyperlinks, inserting images, clip art, audio, video, objects, tables and charts.

Week 13 - Task 3 : Concentrating on the in and out of Microsoft power point and presentations in LaTeX. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes :- Master Layouts (slide, template, and notes), types of views (basic, presentation, slide slotter, notes etc), Inserting: Background, textures, design templates, hidden slides. 23

Week 14 - Task 4 : Entire week concentrates on presentation part of LaTeX and power point. Topic covered during this week includes: Using auto content wizard, slide transition, custom animation, auto rehearsing publisher.

Week 15 : Help students in preparing their personal website using microsoft/ equivalent (FOSS) tool publisher. Topic covered during this week includes publisher orientation, using templates, layouts, inserting text objects, Editingtext objects, inserting tables, working with menu objects, inserting pages, hyper linking, renaming, deleting, modifying pages, hosting website.

References

1. Vikas Gupta, Comdex Information Technology course tool kit, WILEY Dreamtech, 2009.
2. Cheryl A Schmidt, The Complete Computer upgrade and repair book, 3/e, WILEY Dreamtech, 2002.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2006.
4. Kate J. Chase, PC Hardware and A+Handbook, PHI (Microsoft), 2000.
5. Leslie Lamport, LaTeX Companion, PHI/Pearson, 1998.
6. All LaTeX and others related material is available at
(a) www.sssolutions.in
(b) www.sontisoftsolutions.org

Semester-IV

MATHEMATICS IV

Category:	Foundation Course (Basic Science : Mathematics)
Prerequisite:	Basics of matrices, polynomials, differentiations & integrations.
Learning Objective:	The objective is to give the details of problems and solution procedures for various aspects of matrices, vectors and their orthogonalizations. Also to give various numeric schemes for some advanced as well as classical problems in different situations in research.
Learning Outcome:	It is applicable in Principal Component Analysis and many other recent trends in engineering and technology.

UNIT – I: Matrices & System of linear equations (12 Hours)

Elementary row transformations – rank – Echelon form- normal form – gauss elimination – Direct method – LU decomposition – solution of tridiagonal system- Eigen value – Eigen vectors – Cayley-Hamilton theorem- Model and Spectral matrices – Hermitian- orthogonal- quadratic form - semi definite – unitary

UNIT – II: Vector Space (12 Hours)

Space coordinates – vectors (addition and Scalar multiplication) – dot product – Application to Geometry- vector Space – Subspaces – span of a set – More about sub space – Linear Dependence, Independence – dimension and Basis, Linear Transformation, Matrix representation. Inner product-norm, Orthoganalisation process.

UNIT – III:Numerical Computation (12 Hours)

Computer arithmetic, floating point numbers, operations, normalization, their consequences, Absolute, relative and percentage errors. Iterative method, Numerical solution of polynomials: Bisection method, False position, secant and Newton-Raphson method.

UNIT – IV: Numerical Integration and Numerical Solution of differential equations (12 Hours)

Basics of Numerical Integration: Newton-cotes rules: Trapezoidal and Simpson's rule, and their generalization, Modified Euler's method, Taylor series method and Runge-Kutta method(upto 4th order)

TEXT BOOKS

1. Linear Algebra and Its Application by Gilbert Starng , Thomson Books
2. Numerical methods by Jain, Iyenger& Jain, New Age International publishers

REFERENCE BOOKS:

1. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill)
2. Higher Engineering Mathematics - B.S. Grewal, Khanna Publications.

Other References: (Web)

1. MIT: ONLINE LINEAR ALGEBRA COURSE BY GILBERT SRANG
2. NPTCL: ONLINE LINENEAR ALGEBRA AND NUMERICAL ANALYSIS COURSE

OPERATING SYSTEM

Category: Programme core

Prerequisites:
A course on "Computer Programming and Data Structures"
A course on "Computer Organization and Architecture"

Learning Objectives:

Provide an introduction to operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)Introduce the issues to be considered in the design and development of operating systemIntroduce basic Unix commands, system call interface for process management, interprocesscommunication and I/O in Unix

Learning Outcomes:

To master the concepts of a process and how the processes are scheduled and synchronized.To develop the understanding of detecting a deadlock situation and be able to recovery from it.To understand the different approaches to memory management and disk management. To understand the structure and organization of the file systems and I/O systems.

UNIT – I: INTRODUCTION AND PROCESS MANAGEMENT (10 Hours)

Operating System Overview: -Introduction, The Need of Operating Systems, Evolution of Operating Systems, Types of Operating Systems, Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls, Virtual Machines, System Design and Implementation.

Process Management – Process concepts, Life cycle, PCB, Schedulers, Process Scheduling, Threads, Scheduling Levels, CPU Scheduling: Scheduling-Criteria, Algorithms, Algorithm Evaluation, interprocess communication.

UNIT – II: CONCURRENCY CONTROL AND MEMORY MANAGEMENT (10 Hours)

Concurrency:-Process synchronization, The Critical- Section Problem, Peterson's Solution, synchronization Hardware, Semaphores, Classic problems of synchronization, Monitors
Memory Management:- Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Virtual memory, Demand Paging, Page-Replacement, Algorithms, Allocation of frames, thrashing.

UNIT – III: DEAD LOCK, FILE SYSTEMS (10 Hours)

Deadlocks:- System Model, Deadlock Characterization, Deadlock Prevention, Deadlock Detection and Avoidance, Recovery from Deadlock.
File system Interface: Concept of a File, Access Methods, Directory structure, File System Mounting, File sharing, Protection.
File System Implementation: File -system structure, File- system Implementation, Directory Implementation, Allocation methods, Free-Space Management, Efficiency and Performance,

UNIT – IV: MASS STORAGE, PROTECTION, SECURITY (10 Hours)

Secondary Storage Structure:- Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Formatting, Swap-Space Management, RAID structure.
Protection:- Domain of Protection, Access Control, Access Matrix, Access Control Lists, Capability Lists.
Security:-Security Objectives, Security Problems, Intruders, Inside System Attacks, Outside System Attacks, Cryptography as a Security Tool, Intrusion Detection System.

TEXT BOOKS:

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Principles of Operating systems- Naresh Chauhan,Oxford Higher Education.

REFERENCE BOOKS:

1. Operating Systems – Internal and Design Principles Stallings, Fifth Edition–2005, Pearson education.
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum Pearson/PHI.

PROGRAMMING WITH JAVA

Category: Program Core Course
Prerequisites: A course on "Computer Programming & Data Structures".

Learning Objectives

Introduces object oriented programming concepts using the Java language.
Introduces the principles of inheritance and polymorphism; and demonstrates how they relate to the design of abstract classes.
Introduces the implementation of packages and interfaces.
Introduces exception handling, event handling and multithreading.
Introduces the design of Graphical User Interface using applets and swings.

Learning Outcomes

Develop applications for a range of problems using object-oriented programming techniques
Design simple Graphical User Interface applications

UNIT- I (10 hours)

Java Evolution and Environment: Java evolution, overview of java language, java history, features of java, how java differs from C and C++, java and World Wide Web, web browser.
Java Environment: Java Development Kit(JDK), Application Programming Interface(API), java programming structure, java tokens, constants, variables, expressions, decision making statements and looping, java statements, overview of arrays and strings, machine neutral, Java Virtual Machine(JVM), Command Line Arguments.
Arrays and Strings: One-dimensional arrays, creating an array, declaration of arrays, initialization of arrays, two-dimensional arrays, string arrays, string methods, string buffer class, vectors, wrapper classes, Basic I/O Streams: Scanner, buffered reader.

UNIT-II (10 hours)

Classes, Objects and Methods: Introduction, defining a class, creating objects, accessing class members, constructors, method overloading, staticmembers.Inheritance: Defining a sub-class,

sub-class constructor, multi-level variables, final classes and finalize methods, abstract methods and classes, visibility control.
Managing Errors and Exceptions: Introduction, types of errors: compile time and run-time errors, exceptions, types of exceptions, syntax of exception handling code, multiple catch statements, using finally statement, throwing our own exceptions.

UNIT- III **(10 hours)**

Interfaces, Package and Multi-threaded Programming: Introduction, defining interfaces, extended interfaces, implementing interfaces. Package: Creation, importing a package and user-defined package. Threads: Introduction to threads, creating threads, extending the thread class, implementing the 'runnable' interface, life-cycle of a thread, priority of a thread, synchronization, and deadlock.

UNIT- IV **(10 hours)**

Applet programming: Introduction, how applets differ from applications, building applet code, applet life cycle, about HTML, designing a web page, passing parameters to applets, getting input from the user.Graphics Programming: Introduction, abstract window toolkit class hierarchy, frames, event-driven programming, layout managers, panels, canvases, drawing geometric figures.Introduction to Swings: Introduction to Swings, overview of Swing components: Jbutton, JCheckBox, JRadioButton, JLabel, JTextField, JTextArea, JList.
Introduction to Networking:InetAddress class, socket class, URL class.

Text Book:

1. Herbert Schildt, The Java Complete References, 9/e, Tata McGraw Hill, 2014.

References:

1. Y.Daniel Liang, An Introduction to JAVA Programming, Tata McGraw Hill, 2009.
2. Kathy Sierra, Head First java, 2/e, Shroff Publishers, 2012.
3. E. Balaguruswamy, Programming with JAVA, 2/e, Tata McGraw Hill, 2014.

DESIGN AND ANALYSIS OF ALGORITHM

Category: Programme Core Course
Prerequisites: Data Structure
Learning
Objectives: The student should be made to:

1. Learn the algorithm analysis techniques.
2. Become familiar with the different algorithm design techniques.
3. Understand the limitations of Algorithm power.

Learning Outcomes:

1. Design algorithms for various computing problems and analyze the time and space complexity of algorithms.
2. Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.
3. Understand the necessary mathematical abstraction to solve problems and come up with analysis of efficiency and proofs of correctness 4. Comprehend and select algorithm design approaches in a problem specific manner and also modify existing algorithms to improve efficiency.

UNIT- I **(10 Hours)**

Introduction, Definition, Chrematistics of algorithm, Growth of Functions, Asymptoticanalysis, Amortized analysis, standard notations and common functions, Recurrences, solution of recurrences by substitution, recursion tree, induction method, and Mastermethods, Algorithm design techniques, worst case analysis of Merge sort, Quick sort andBinary search, Design & Analysis of Divide and conquer algorithms.

UNIT – II **(10 Hours)**

Heapsort mechanism, Heaps, Building a heap, Theheapsort algorithm, Priority Queue,Lower bounds for sorting. Dynamic programming methodology, Elements of dynamicprogramming, Matrix-chain multiplication, Longest common subsequence, GreedyAlgorithms, Elements of Greedy strategy, Assembly-line scheduling, Activity selectionProblem, Fractional knapsack problem, Huffman codes).

UNIT – III **(10 Hours)**

Data structure for disjoint sets, Disjoint set operations, Linked list representation, B and B + tree, connected components and bi connected components. Breadth first search and depth-first search, Minimum Spanning Trees, Kruskal algorithm and Prim's algorithms, single- source shortest paths (Bellman-ford algorithm and Dijkstra'salgorithms), All-pairs shortest paths (Floyd – Warshall Algorithm).

UNIT – IV **(10 Hours)**

Back tracking, Branch and Bound, Eight Queen problem, Travelling sales person problem, 0/1 knapsack problem, NP - Completeness (Polynomial time, Polynomial time verification, NP - Completeness and reducibility, NP-Complete problems (without Proofs), Approximation algorithmscharacteristics, Traveling Salesman Problem.

Text Book:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest, C.Stein : Introduction to Algorithms, 2nd Edition, PHI Learning Pvt. Ltd.
2. H. Bhasin: Algorithms, Design and Analysis, First Edition, Oxford Higher Education.

Reference Books:

1. Sanjay Dasgupta, UmeshVazirani: Algorithms, McGraw-Hill Education.
2. Horowitz &Sahani: Fundamentals of Algorithm, 2nd Edition, Universities Press.
3. Goodrich, Tamassia: Algorithm Design, Wiley India.

OPERATING SYSTEM LAB CS 2203

List of Programs

1.Study of Unix/Linux Commands. Study of editors in Linux , Detail study of File. Access Permission in Linux/Unix . Detail study of LINUX Shell Programming.

2. Write a program to implement best fit algorithm in paging memory.
3. Write a program to implement first fit algorithm in paging memory.
4. Write a program to implement worst fit algorithm in paging memory.
5. Write a program to create a unique file name by the user or by the system.
6. Write a program to implement DEKKERS ALGORITHM for mutual exclusion problem.
7. Write a program to implement DINING PHILOSOPHER problem.
8. Write a program for FCFS CPU scheduling algorithm.

9. Write a program for FIFO page replacement algorithm.
10. Write a program for LRU page replacement algorithm.
11. Write a program for Optimal page replacement algorithm.
12. Write a program to implement paging scheme.
13. Write a program for ROUND ROBIN CPU scheduling algorithm.
14. Write a program for SJF CPU scheduling algorithm.
15. Write a program to implement producer-consumer problem of IPC.
16. Write a program for to create two processes and wait for them to complete.
17. Write a program to make packaging and sending as in IPC.
18. Write a program to illustrate the function of a dispatcher.

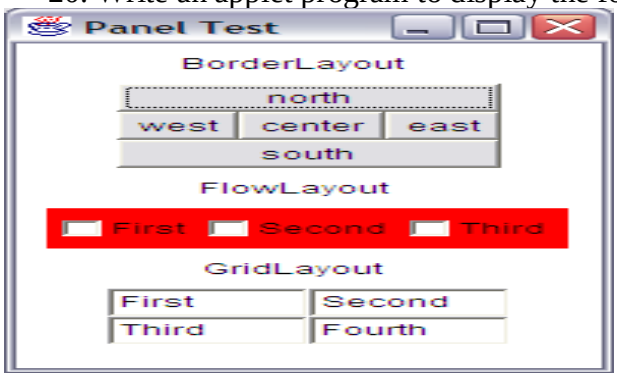
PROGRAMMING WITH JAVA LAB CS 1204

List of Programs

1. Write a java program to read three numeric values (integer) from user andfind the largest number among them.
2. Write a program to print the Fibonacci series up to a given number taken from user through command line.
3. Write a statistical computation program that to find out the maximum, minimum and mean value. Read input through command line.
4. WAP to create a class Rectangle (length, breadth), with zero argument constructor (default value is 5.0), one argument constructor(length = breadth), and two argument constructor, and define the methods area and perimeter of the rectangle. Create different objects with the help of three different constructorsand print the area (length x breadth) and perimeter (2 x (length + breadth)) of those objects.
5. Define a class called Room with the follwing attributes 1.length, 2.breadth, 3.height, 4.floor_area, 5.Wall_area, 6.No.of_fans, 7.No.of_windows, 8.no.of_doors. Define a suitable constructor and a method to display details of a room. Assume that20% of the total wall area is occupied by doors and windows and calculate accordingly. All data must be taken from user.
6. Define a class point, inherit class line from point, rectangle from line, and cube from rectangle. Write no argument constructor in each class. Write a print statement in these constructors mentioning which class it is. Create an object of the cube class in the main method of a separate class called test and show the output.
7. WAP to create a Person class having name, age and gender as instance variables. Write three constructors for constructor overloading like,
   a) First with no-argument.
   b) Second with three arguments for passing name, age and gender.
   c) Third with object as parameter to create a new copy of an existing Person object.

   Display the properties of Person class object with suitable methods.
8. Create an abstract class Shape with methods calc_area and calc_volume. Derive four classes Sphere(radius) , Cone(radius, height) and Cylinder(radius, height), Box(length, breadth, height) from it. Calculate area and volume of all. (Use Method overriding).
9. Define an abstract class “Staff” with members name and address. Define two subclasses of this class – “FullTimeStaff” (department, salary) and “PartTimeStaff” (numberof-hours, rate-per-hour). Define appropriate constructors. Create n objects which could be of either FullTimeStaff or PartTimeStaff class by asking the user’s choice. Display details of all “FullTimeStaff” objects and all “PartTimeStaff” objects.

10. Define an interface "StackOperations" which declares methods for a static stack. Define a class "MyStack" which contains an array and top as data members and implements the above interface. Initialize the stack using a constructor. Write a menu driven program to perform operations on a stack object.
11. Define an interface "QueueOperations" which declares methods for a static queue. Define a class "MyQueue" which contains an array and front and rear as data members and implements the above interface. Initialize the queue using a constructor. Write a menu driven program to perform operations on a queue object.
12. Write a java program to create n objects of the Student class. Assign roll numbers in the ascending order using static method. Accept name and percentage from the user for each object. Define a method "sort Student" which sorts the array on the basis of percentage
13. Write a program to enter the student's name, Rollno. Marks, in any no. of subjects as command line argument and find the percentage and grade of the student and thrown a NumberFormatException if required.
14. WAP having multiple catch and finally blocks where the catch blocks should handle the exceptions like, ArrayIndexOutOfBoundsException, NumberFormatException and ArithmeticException or any other exception.
15. Write a java program to creates ten threads, each of which do some work(search for the maximum value of a large matrix .Each thread searches one portion of the matrix.) It waits for them all to finish, then gathers the results.
16. Write a java program to show the use of synchronized method ().
17. Write a program to remove common characters from two strings.
18. Write a program to print all the palindrome words of a given string.
19. Input some strings through command line. Half of which will be stored in a String array and rest will be stored in a StringBuffer array. Write a program that will concatenate each element of this array of String objects with each element of StringBuffer objects. And the result will be stored in an array of StringBuffer.
20. Write an applet program to display the following by using different layouts.



ALGORITHM LAB. CS 2204

LIST OF TOPICS FOR EXPERIMENTS

1. Apply the divide and Conquer technique to arrange a set of numbers using merge sort method.
2. Write programs to implement the following:
   a) Prim's algorithm.
   b) Kruskal's algorithm.
3. Write a program to find optimal ordering of matrix multiplication.

(Note: Use Dynamic programming method).

1. Perform graph traversals.
2. Implement the 8-Queens Problem using backtracking.
3. Implement Quick sort algorithm.

6. Write a program to implement dynamic programming algorithm to solve all pairsshortest path problem.

7. Write a program to solve knapsack problem using the following:
   a) Greedy algorithm.
   b) Dynamic programming algorithm.
   c) Backtracking algorithm.
   d) Branch and bound algorithm.

8. Write a program that uses dynamic programming algorithm to solve the optimal binary search tree problem.

9. Write a program for solving traveling sales persons problem using the following:
   a) Dynamic programming algorithm.
   b) The back tracking algorithm.
   c) Branch and Bound.

Semester-V

THEORY OF COMPUTATION

Category: Programme Core Course

Prerequisite: Fundamental of computer science and mathematics

Learning Objective:
1. To introduce concepts in automata theory and theory of computation.
2. To identify different formal language classes and their relationships.
3. To design grammars and recognizers for different formal languages

Learning Outcome: This course enables us to understand the concepts of theory of Computation and its applications.

UNIT –I:INTRODUCTION (12 Hours)

Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT –II: REGULAR EXPRESSION(12 Hours)

Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages,

UNIT –III: CONTEXT FREE GRAMMAR(12 Hours)

Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, PDA with two stacks.

UNIT –IV: TURING MACHINES(12 Hours)

Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory

TEXT BOOKS:

1. John E. Hopcroft, Rajeev Motwani and Jeffery D. Ullman, Automata Theory, Languages, and Computation (3rd. Edition), Pearson Education, 2008.
2. Peter Linz ,An Introduction to Formal Languages and Automata, Paperback – 2011

REFERENCE BOOKS:

1. K. L. P. Mishra and N. Chandrashekaran, Theory of Computer Science: Automata, Languages and Computation, Indian3rd Edition 2006.
2. H.R.Lewis and C.H.Papadimitriou, Elements of The theory of Computation, Second Edition, Pearson Education/PHI, 2003
3. Michael Sipser, Introduction to the Theory of Computation, Books/Cole Thomson Learning, 2001.

DATABASE MANAGEMENT SYSTEMS

Category: Programme Core Course

Prerequisite: Basic Knowledge of Computer Programming and data structures

Learning Objective: Classify modern and futuristic database applications based on size and complexity; design a database from understanding an Universe of Discourse, using ER diagrams; map ER model into Relational model and to normalize the relations; create a physical database from a design using DDL statements with appropriate key, domain and referential integrity constraints; analyze different ways of writing a query and justify which is the effective and efficient way; and compare and contrast various indexing strategies in different database systems and list key challenges in advanced database systems and to critique how they differ from traditional database systems.

Learning Outcome: To study the concepts of databases especially Relational Database design and query languages.

UNIT –I:INTRODUCTION TO DATABASE SYSTEMS (10 Hours)

Data - Database Applications - Evolution of DB & DBMS - Need for data management – Data models & Database Schema Architecture - components of DBMS - Key issues and challenges in Database Systems

E/R Model - Conceptual data modeling -E/R diagram notation, ER Diagrams - Relational Model - ER to Relational Mapping - Constraints - Keys - Dependenciesexamples.

UNIT –II: DATABASE LANGUAGE AND DATABASE DESIGN (10 Hours)

Introduction to Database Languages: Relational Algebra, Relational Calculus, SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL, notion of aggregation, aggregation functions group by and having clauses, embedded SQL.

Database Design: Introduction to Functional Dependency and Normalization – Concept of functional dependency, First, Second, Third & Fourth Normal Forms - BCNF – Join Dependencies-other Normal forms

UNIT –III: TRANSACTIONS & CONCURRENCY AND PHYSICAL DATABASE DESIGN (10 Hours)

Introduction to Transactions: Transaction Systems - ACID Properties - System & Media Recovery - Two Phase Commit Protocol - Recovery with SQL - Need for Concurrency Locking Protocols - Deadlocks & Managing Deadlocks - SQL Support for Concurrency.

Storage Strategies: Indices, B-Trees, Hashing, Indexing.

UNIT –IV: QUERY PROCESSING AND ADVANCES IN DATABASES(10 Hours)

Query Processing and Optimization: Query Tree, Evaluation of Relational Algebra Expressions, Query Equivalence, Join strategies, Query Optimization Algorithms. Introduction to Special Topics : Spatial & Temporal Databases – Data Mining & Warehousing - Data Visualization - Mobile Databases - OODB & XML Databases - Multimedia & Web Databases.

TEXT BOOKS:

1. Elmaski & Navathe -Fundamentals of Database Systems, 4th Edition, Pearson Education

REFERENCE BOOKS:

1. Database Systems, Thomas Connolly, Carolyn Begg
2. C.J. Date - An introduction to Database Systems, Pearson Education
3. Avi Silberschatz, Henry F. Korth , S. Sudarshan,Database System Concepts
4. Bipin Desai -An introduction to Database System, Galgotia Publication.
5. Raghu Ramakrishnan, "Database Management Systems", Third Edition, McGraw Hill, 2002.

WEB REFERENCES

1. http://cs.stanford.edu/people/widom/cs346/ioannidis.pdf
2. http://nptel.ac.in/courses/106106093/

COMPUTER NETWORKS

Category: Program Core Course
Prerequisites: Basic Computer Science

Learning Objective: To produce a core knowledge of networking concepts and techniques to design simple networks.Provide in depth knowledge about the various communication technologies
Learning Outcomes: Enable the student to understand how information is transmitted in networks

UNIT- I **(10 hours)**

Introduction: Uses of computer networks, Reference models: OSI reference model, TCP/IP reference model, network standardization. Examples of data communication Services; X.25, networks, Frame relay and ATM . Medium access control: channel allocation problems, multiple access protocols: ALOHA, CSMA, collision frees protocols.

UNIT- II **(10 hours)**

IEEE standards 802.3,Ethernet**:** Ethernet physical layer, Ethernet MAC sub layer protocol, Ethernet performance, switched Ethernet, fast Ethernet, gigabit Ethernet, IEEE802.4,IEEE802.5.
Data link layer switching: Uses of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways.

UNIT- III **(10 hours)**

Network Layer: Network layer design issues, routing algorithms, optimality principle, shortest path, flooding, distance vector routing, count-to-infinity problem, link state algorithm, hierarchical routing, congestion control algorithms-General principles of congestion prevention policies. Quality of service: Introduction, traffic shaping. The Network layer in the Internet: IPv4, IP Addresses, IPv6 Protocol, CIDR, Internet Control Protocols: ICMP, ARP, RARP and DHCP.

UNIT- IV **(10 hours)**

Transport Layer: The transport service: Services provided to the upper layers, transport service primitives, Berkeley Sockets, elements of transport protocols.The Internet Transport Protocols: UDP, TCP, the TCP service model, the TCP protocol, the TCP segment header, TCP connection establishment, TCP connection release. Application Layer: The Domain Name System, electronic mail, World Wide Web: Architectural over view

TEXT BOOKS:

1. Andrew S. Tannenbaum and David J. Wetherall, Computer Networks, 5/e, Pearson Education, 2010.

REFERENCE BOOKS

1 Behrouz A. Forouzan and FirouzMosharraf, Computer Networks: A Top-Down Approach, McGraw Hill, 2011.
2 S.Keshav, Engineering Approach to Computer Networks, 2/e, Pearson Education, 1997.
3 Larry L.Peterson and Bruce S.Davi, Computer Networks: A Systems Approach, 4/e, Elsevier Publication, 2003.

DISCRETE MATHEMATICS

Category: Foundation Course (Basic Science : Mathematics)
Prerequisite: Basics of set theory and combinatory.
Learning Objective: The objective is to introduce Logic, Graphs and Algebraic structures.
Learning Outcome: Logics and graphs are the key points for algorithm, Networking, coding and many more recent areas. This course helps to understand some areas of

computer science in detail.

UNIT – I: Logic (12 Hours)
Mathematical reasoning; propositions; negation disjunction and conjunction; implication and equivalence; normal form; truth tables; predicates; quantifiers; natural deduction; rules of Inference; methods of proofs; resolution principle; Automatic theorem proving, Fuzzy logic: fuzzy relation,, pattern classification, fuzzy analysis, distance between fuzzy sets, area perimeter, height, width of fuzzy subsets.

UNIT – II: Sets, Relation & Functions (12 Hours)
Set theory; Paradoxes in set theory; inductive definition of sets and proof by induction; Peono postulates; Relations; representation of relations by graphs, Warshall's algorithm; properties of relations; equivalence relations and partitions; Partial orderings; Posets; Linear and well-ordered sets; Functions; mappings; injection and surjections; composition of functions; inverse functions; special functions; pigeonhole principle.

UNIT – III: Graph Theory (12 Hours)
Graph Theory; elements of graph theory, Graph Isomorphism, connected graph, Euler graph, Hamiltonian path, Grinberg's theorem, trees, tree traversals, spanning trees, BFS & DFS; minimal spanning tree, Kruskal's algorithm, Prim's algorithm, planar graph, dual of a graph, Euler formula.

UNIT – IV: Algebraic Structures & Combinatories (12 Hours)
Definition and elementary properties of groups, semigroups, monoids, rings, fields, vector spaces and lattices; Elementary combinatorics; counting techniques; recurrence relation; generating functions

TEXT BOOKS
1. C. L. Liu, Elements of Discrete Mathematics, McGraw-Hill.
2. K. H. Rosen, Discrete Mathematics and applications, TataMcGraw Hill

REFERENCE BOOKS:
1. J .L. Mott, A. Kandel, T.P .Baker, Discrete Mathematics for Computer Scientists and Mathematicians, second edition 1986, Prentice Hall of India.
2. R. Grimaldi and B V Ramana, Discrete and combinatorial mathematics: An applied introduction, Pearson education

SOFTWARE ENGINEERING

Category: Program Core Course
Prerequisites: Knowledge on programming and data structure
Learning Objectives: To understand common cycle process life processes.

- To understand the basic concepts in Requirement engineering,software design, coding, testing and maintenance
- To learn about the role of project management including scheduling,planning,risk management etc.
- To have a basic knowledge about software quality,how to ensure good quality software.

Learning Outcomes: After successful completion of the course the students will be able to demonstrate basic software engineering methods and practices and their appropriate application

UNIT – I: (10 Hours)
Introduction to software and software engineering, various software process modules, capability, maturity, module and KPAs.Project planning, project introduction, team organization, scheduling and management, constructive cost model. Software measures, indicators and metrics, software risk analysis and management.

UNIT – II: (10 Hours)
Software requirement analysis and specifications, applicability to small, medium, and large-scale systems.Software design, technical design, objectives of design, design metrics, modularity, module coupling and cohesion, relation between cohesion and coupling; Design strategies: Bottom up design, top down design, functional oriented design, object oriented design; IEEE recommended practice for software design description

UNIT – III: (10 Hours)
Software testing, testability, testing process, structural testing, unit testing and integrated testing, debugging, testing tools, software maintenance, maintenance process, maintenance cost, reverse engineering and reengineering.

UNIT – IV: (10 Hours)
Configuration management, Software Quality:Evolution of software quality,assessing and controlling software quality.softwarereliability:Hardwarevs Software reliability,Reliability metrics. CASE tools and workbenches.

TEXT BOOKS
1. Pressman R., "Software Engineering", McGraw-Hill.

REFERENCE BOOKS:
2. Sommerville, I., "Software Engineering", Pearson Education.
3. Dfleeger, S. L., "Software Engineering", Pearson Education.
4. Rajib Mall, Software Engineering

DATABASE MANAGEMENT SYSTEMS LABORATORY CS 2206

LIST OF TOPICS FOR EXPERIMENTS:
PART A : SQL :
1. DDL Statements (Create, Alter, Drop)
2. DML Statements (Insert, Update, Delete)
3. SELECT Statement : Information retrieval
4. Use of In-built functions (e.g. aggregate functions like Min, Max, Average… etc, time date functions…)
5. TCL statements (COMMIT, ROLL BACK, CHECK POINT)
6. Views, Sequence, Types (ORDBMS)
7. Security Management Commands (like GRANT and REVOKE)

PART B : PL/ SQL:
1. Un-named block
2. Named Blocks (FUNCTIONS, PROCEDURES)
3. Active Database Concepts (TRIGGERS)
4. PACKAGES

REFERENCE BOOKS:

4. ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition
5. ORACLE DATA BASE LOG PL/SQL Programming SCOTT URMAN, Tata Mc- Graw Hill.
6. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande.

COMPUTER NETWORKS LAB.CS 2207

LIST OF TOPICS FOR EXPERIMENTS

1. Few interactive experiments related to router, cabling, H/W and software configuration for computer communication.
2. Some Network protocols simulation using NetSim, NS2, or any other protocol simulators for:
   A. Analyzing number of transmitting nodes vs. collision count, mean delay for Ethernet LAN .
   B. Analyzing bus vs. star-switch with respect to number of collisions (for a fixed number of transmitting nodes) for Ethernet LAN
   C. Analyzing performance of token ring with number of nodes vs. response time, mean delay.
   D. Comparing the throughput and normalized throughput for token ring and token bus for different transmitting nodes.
   E. Comparing the CSMA/CD vs. CSMA/CA protocols (for a fixed number of transmitting nodes).
   F. Analyzing thedifference between unicast and broadcast transmission (for a fixed number of transmitting nodes).
   G. Verification of stop-and-wait protocol, Go-back-N protocol, Selective repeat protocol, distance vector routing algorithm, state routing algorithm.
3. Socket programming.

WEB REFERENCES:

1. https://www.isi.edu/nsnam/ns/
2. https://www.javatpoint.com/socket-programming

Semester-VI

ARTIFICIAL INTELLIGENCE

Category: Programme Core Course

Prerequisite: Fundamental of computer science and mathematics

Learning Objective:

To learn the difference between optimal reasoning Vs. human like reasoning.
To understand the notions of state space representation and heuristic search.
To learn different knowledge representation techniques.
To understand the applications of AI: namely Game playing, Theorem Proving. Expert systems , machine learning and Natural language Processing.

Learning Outcome: This course enables us to understand the concepts of artificial intelligence and its applications.

UNIT- I Introduction to AI and Production system(12 Hours)

Introduction to Artificial Intelligence, AI Problems, AI Techniques,Problems ,Problem Space and Search, Defining the problem as a state space search, Production system, Problem characteristics, Heuristic search Technologies**:** Generate and Test, Hill Climbing, Best First Search, Problem Reduction, means-end-analysis, optimal and A*,AND-OR Graphs, AO* Algorithms.

UNIT- II Knowledge Representation(12 Hours)

Representation Knowledge using Predicate Logic, Representing simple facts in logic, Representing Instance and ISA relationships, Computable functions and Predicates, Resolution, Representing Knowledge using Rules, Forward Vs Backward Reasoning, Matching , Control Knowledge, , Weak slot and Filter structures, Semantic nets, Frames.

UNIT-III Reasoning Techniques: (12 Hours)

Strong slot and Filter structures, Conceptual Dependencies, Scripts. Introduction to Non monotonic reasoning ,Logics for Non monotonic reasoning, Implementation : Depth First Search, Dependency-Directed Back Tracking, Justification based Truth Maintenance Logic based Truth Maintenance systems,Statistical Reasoning, Probability and Bayes Theorem,Certainty factors, Rule based Systems, Beyesian Networks, Dempster-Shaffer Theory

UNIT -IV Game Playing and learning(12 Hours)

Minmax search, alpha-beta cutoffs, Planning system, Goal stack planning, Hierarchical Planning, Natural Language Processing., Syntactic Analysis, Semantic Analysis, Discuses and Pragmatic Processing. Introduction and Fundamentals of Artificial Neural Networks, Biological Prototype, Artificial Neuron, Single Layer Artificial Neural Networks, Multilayer Artificial Neural Networks, Training of Artificial Neural Networks

TEXT BOOKS:

1. Elaine Rich, Kevin Knight and ShivashankarB . Nair, Artificial Intelligence, 3/e, McGraw Hill Education, 2008.
2. Neural Computing: Theory and practice- Waserman.

REFERENCES:

1. Artificial Intelligence Structures and Strategies complex problem solving-George F. Lugar Pearson Education
2. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2/e, Pearson Education, 2010.
3. Dan W. Patterson, Artificial Intelligence and Expert Systems, PHI.
4. Neural Networks: A Comprehensive Foundation 2/e- Symen Pearson Education.

WEB TECHNOLOGY

Category:	Programme Core Course
Prerequisite:	Fundamentals of Programming and Networking
Learning Objective:	Describe the concepts of WWW including browser and HTTP protocol. List the various HTML tags and use them to develop the user friendly web pages. Define the CSS with its types and use them to provide the styles to the web pages at various levels. Develop the modern web pages using the HTML and CSS features with different layouts as per need of applications. Use the JavaScript to develop the dynamic web pages. Use server side scripting with PHP to generate the web pages dynamically using the database connectivity. Develop the modern Web applications using the client and server side technologies and the web design fundamentals.
Learning Outcome:	This course enables students to understand the concepts of WWW and assists students to develop dynamic web applications with database connectivity.

UNIT –I:INTRODUCTION(8 Hours)

Introduction: Concept of WWW, Internet and WWW, HTTP Protocol : Request and Response, Web browser and Web servers, Features of Web 2.0.

Web Design: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation

UNIT –II: HTML and CSS(12 Hours)

HTML: Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5.

Style sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3

UNIT –III: JAVA SCRIPT and XML(10 Hours)

JavaScript: Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML : Combining HTML, CSS and Javascript, Events and buttons.

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT

UNIT –IV: PHP and MYSQL(10 Hours)

PHP: Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP.

PHP and MySQL: Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs.

TEXT BOOKS:

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India.
2. Web Technologies, Black Book, dreamtech Press
3. HTML 5, Black Book, dreamtech Press

REFERENCE BOOKS:

1. Web Design, Joel Sklar, Cengage Learning
2. Developing Web Applications in PHP and AJAX, Harwani, McGrawHill
3. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel, Pearson

WEB REFERENCES

1. www.w3schools.com

COMPILER DESIGN

Category:	Programme Core Course
Prerequisite:	Theory of Computation / Automata theory
Learning Objective:	To learn various stages of compilation, design phases of a compiler construction process. This course will also introduce open source tool Lex and Yaac.
Learning Outcome:	Specify and analyse the lexical, syntactic and semantic structures of advanced language features Separate the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation Write a scanner, parser, and semantic analyser without the aid of automatic generators

UNIT –I:INTRODUCTION(8 Hours)

Overview of Compilation: Phases of Compilation – Lexical Analysis, Regular Grammar and regular expression for common programming language features, pass and Phases of translation, interpretation, bootstrapping, data structures in compilation – LEX lexical analyzer generator.

UNIT –II: PARSING (12 Hours)

Syntax Analysis: Role of a parser, context free grammars and context free languages, parse trees and derivations, ambiguous grammar.

Top Down Parsing: Recursive descent parsing, LL (1) grammars, non-recursive predictive parsing, error reporting and recovery.

Bottom Up Parsing: Handle pruning and shift reduces parsing, SLR parsers and construction of SLR parsing tables, LR(1) parsers and construction of LR(1) parsing tables, LALR parsers and construction of efficient LALR parsing tables, parsing using ambiguous grammars, error reporting and recovery, parser generator

UNIT –III: SDT,SYMBOL TABLE AND INTERMEDIATE CODE GENERATION(10 Hours)

Syntax Directed Translation: Syntax directed definitions (SDD), inherited and synthesized attributes, dependency graphs, evaluation orders for SDD, semantic rules, application of syntax directed translation.

Symbol Table: Structure and features of symbol tables, symbol attributes and scopes.

Intermediate Code Generation: Introduction, benefits and types of intermediate code generation, three address codes - quadruples and triples, DAG for expressions, types and declarations, translation of expressions, translation of Boolean expressions and control flow statements, back patching, intermediate code generation for procedures.

UNIT –IV: REAL-TIME DATABASES AND COMMUNICATION, APPLICATIONS (10 Hours)

Run Time Environment: storage organizations, static and dynamic storage allocations, stack allocation, Activation of the procedure and the activation record.

Code Generations: Introduction, Major Issues of Code generation, registers allocation, simple code generation using basic blocks.

Elements of Code Optimization: Objective, peephole optimization, redundant and un-reachable codes, concepts of elimination of local common sub-expressions, basics of flow of control optimization.

TEXT BOOKS:

1. Principles of Compiler Design, A.V. Aho .J.D.Ullman; Pearson Education.
2. Modern Compiler Implementation in C- Andrew N. Appel, Cambridge University Press.

REFERENCE BOOKS:

1.Lex&Yacc, John R. Levine, Tony Mason, Doug Brown, O'reilly
2.Modern Compiler Design, Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley dreamtech.
3.Engineering a Compiler, Cooper & Linda, Elsevier.
4.Compiler Construction, Louden, Thomson

WEB REFERENCES

1http://nptel.ac.in/courses/106108113/

COMPILER DESIGN LABORATORY CS 2208

List of Experiments

1. Implement transition diagram for identifying an identifier and classify whether it is either variable or array or function or structure.
2. Implement transition diagram for identifying constant and classify whether it is integer or real.
3. Write a LEX specification which takes input from a file (a C' program) and recognize valid identifiers, keywords contained in the program and store them in a file.
4. Write a LEX specification for lexical analyzer of C language in which it recognizes all possible tokens in a given program taken as a file and output all the tokens into another file.
5. Write a program to implement Recursive Descent Parser for any given grammar.
6. Write a program to implements Operator Precedence Parsing algorithm.
7. Consider the following Expression language that used to describe the Arithmetic expressions in a Calculator The syntax of the language is defined by following grammar

<line>→<exp>\n
<exp>→<exp>+ <term>| <exp>-<term>|<term>

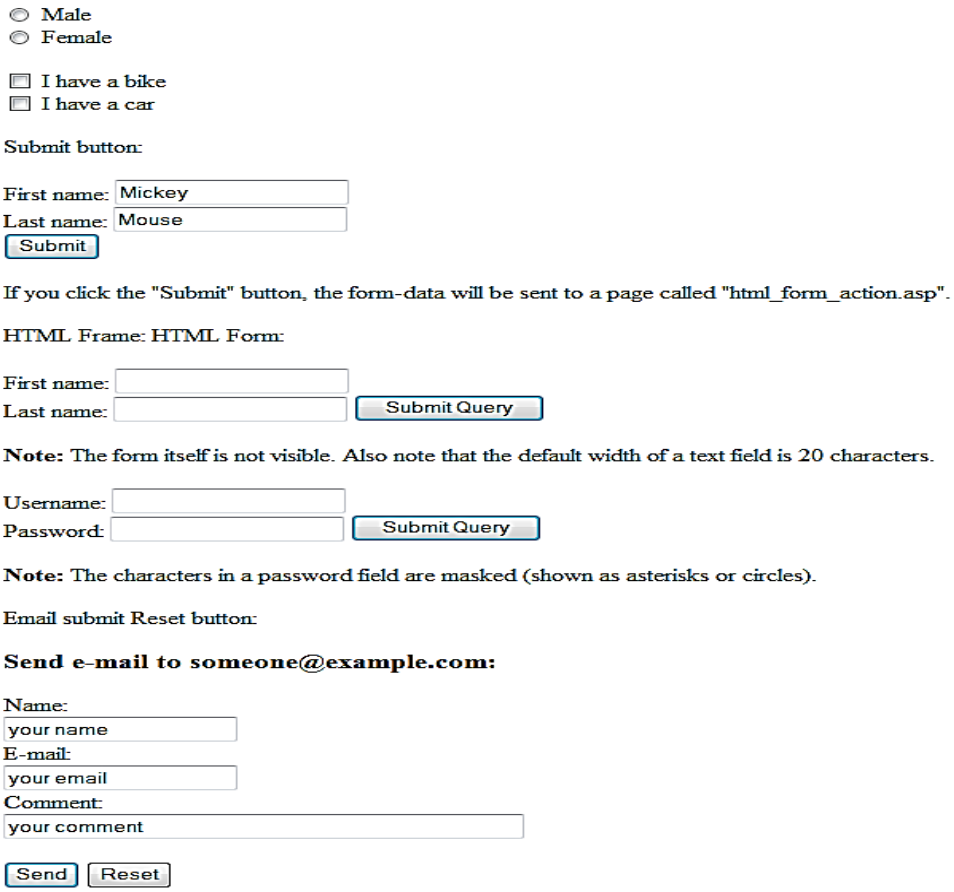
<term>→<term>*<factor>|<term>/<factor>/<factor>
<factor>→(<exp>)|<value>
<value>→<lettert>|<digit>
A sample arithmetic expression written in this language is:
(a+b) * c\n or 2 + 4 * 5 - 6 /2\n
a) Design a LEX specification for the above language. (Iignore redundant spaces, tabs and newlines). Although the syntax specification states that value can be arbitrarily long, you may restrict the length to some reasonable value. (Implement the lexical analyser using JLex, flex or lex or any other tools)
b) Write YACC Specification to validate any given arithmetic expression accepted by the above grammar.
c) Write YACC specification to evaluate the given arithmetic expression accepted by the above grammar.
d) Write YACC specification to generate three address code and quadruples for any given expression.
e) Write YACC specification to convert an infix expression to a postfix expression.
8. Consider the following grammar which is used to describe the X language which might be used in next generation programmable calculators. It supports integer, real and complex numbers This language uses something called Hungarian notation the name of the variable itself tells you about the type of the data it contains if the starting letter is 'i' then integer , 'r' then real , 'c' then complex number
<program>→begin<stmts>end
<stmts>→<statement>;<stmts>| <statement>;
<statement>→<identifer>=<expr> | <conditional>
<expr>→<expr> + <term> |<expr>-<term>|<term>
<term>→<term>*<fact>|<fact>
<fact>→<identifier><conditional>--->if <cexpr>thenbegin<stmts>end
<cexpr>→<identifier>==<identifier> |<identifier>!=<identifier>
<identifier>→i<letters>|r<letters>|c<letters>
<letters>→<letter><letters>|<letter>
<letter>→a|b|....|z|A|B|.....|Z
a) Design a LEX specification for the above language. (Ignore the redundant spaces, tabs and newlines). Although the syntax specification states that value can be arbitrarily long, you may restrict the length to some reasonable value. (Use JLex, flex or lex or any other lexical analyser generating tools).
b) Write YACC specification to generate three address code and quadruples for the given arithmetic statement.
c) Write YACC specification to validate the statements of the above mlanguage.
d) Write program to generate 8086 assembly code from the abstract syntax tree or three address code generated by the parser. The target assembly instructions can be simple move, add, sub, and jump. Also simple addressing modes are used.

WEB TECHNOLOGY LAB. CS 2209

1. Design the following static web pages required for an online book store web site. **1) HOME PAGE:** The static home page must contain three **frames**. **2) LOGIN PAGE 3) CATOLOGUE PAGE:**The catalogue page should contain the details of all the books available in the web site in a table.

4) CART PAGE: The cart page contains the details about the books which are added to the cart. **5) REGISTRATION PAGE**

2. Design the following Web page.



3. Write JavaScript to validate the fields of the above page. Write JavaScript to validate the fields of the Login page.
4. Design a web page using CSS which includes the following:
   1) Use different font, styles:
   2) Set a background image for both the page and single elements on the page.
   3) Control the repetition of the image with the background-repeat property.
   4) Define styles for links
   5) Working with layers
   6) Add a customized cursor
5. Write an XML file which will display the Book information. Write a Document Type Definition (DTD) to validate the above XML file. Display the XML file in a table. Use XML schemas XSL and CSS for the above purpose.
6. Create a simple visual bean with a area filled with a color. The shape of the area depends on the property shape. If it is set to true then the shape of the area is Square and it is Circle, if it is false. The color of the area should be changed dynamically for every mouse click. The color should also be changed if we change the color in the "property window ".
7. 1) Install TOMCAT web server and APACHE. 2) Access the above developed static web pages for books web site, using these servers by putting the web pages developed in week-1 and week-2 in the document root.
8. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following. 1. Create a Cookie and add these four user id's and passwords to this Cookie. 2. Read the user id and

passwords entered in the Login form and authenticate with the values available in the cookies.

9. Install a database (Mysql). Create a table which should contain at least the following fields: name, password, email-id, phone number Write a PHP program to connect to that database and extract data from the tables and display them. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.
10. Write a PHP which insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database.

TECHNICAL SEMINAR CS 6501

Student has to select a topic of his/her interest in consultation with the faculty incharge of seminar. He/She can collect information from the books, journals, internet and prepare a report. Prepare a power point presentation on the topics and present to a committee to evaluate the seminar. Seminar is separate for each student.

Semester-VII

DATA WAREHOUSING AND DATA MINING

Category: Programme Core Course

Prerequisite: Data Structure and Algorithm, Linear Algebra, Basics of Web programming

Learning Objective: This course deals with evolving multidimensional intelligent model from a typical system, representation of multi dimensional data for a data warehouse, discovering the knowledge imbibed in the high dimensional system, fiding the hidden interesting patterns in data, and gives the idea to evaluate various mining techniques on complex data objects.

Learning Outcome: This course enable us to understand the concepts of Data Mining and its applications.

UNIT –I:INTRODUCTION TO DATA WAREHOUSING AND ARCHITECTURE (08 Hours)

Evolution of Decision Support Systems- Data warehousing Components –Building a Data warehouse, Data Warehouse and DBMS, Data marts, Metadata, Multidimensional data model, OLAP vs OLTP, OLAP operations, Data cubes, Schemas for Multidimensional Database: Stars, Snowflkes and Fact constellations

UNIT –II: DATA WAREHOUSE PROCESSAND ARCHITECTURE(08 Hours)

Types of OLAP servers, 3–Tier data warehouse architecture, distributed and virtual data warehouses. Data warehouse implementation, tuning and testing of data warehouse. Data Staging (ETL) Design and Development, data warehouse visualization, Data Warehouse Deployment, Maintenance, Growth, Business Intelligence Overview- Data Warehousing and Business Intelligence Trends - Business Applications

UNIT –III: INTRODUCTION TO DATA MINING AND CLASSIFICATIONS(14 Hours)

Data mining-KDD versus datamining, Stages of the Data Mining Process-task premitives, Data Mining Techniques -Data mining knowledge representation – Data mining query languages, Integration of a Data Mining System with a Data Warehouse – Issues, Data preprocessing – Data cleaning, Data transformation, Feature selection, Dimensionality reduction, Discretization and generating concept hierarchies-Mining frequent patterns- association-correlation.

Decision Tree Induction - Bayesian Classifiation – Rule Based Classifiation –Classifiation by Back propagation – Support Vector Machines – Associative Classifiation – Lazy Learners – Other Classifiation Methods

UNIT –IV: CLUSTERING,ADVANCES IN DATA MINING (10 Hours)

Clustering techniques – , Partitioning methods- k-means Hierarchical Methods - distance-based agglomerative and divisible clustering,

Mining complex data objects, Spatial databases, temporal databases, Multimedia databases, Time series and Sequence data; Text Mining –Graph mining-web mining-Application and trends in data mining

TEXT BOOKS:

1. Jiawei Han and MichelineKamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, third edition2011, ISBN: 1558604898.
2. Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", TataMc Graw Hill Edition, Tenth Reprint 2007.
3. G. K. Gupta, "Introduction to Data Min Data Mining with Case Studies", Easter EconomyEdition, Prentice Hall of India, 2006

REFERENCE BOOKS:

1. Mehmedkantardzic,"Dataminingconcepts,models,methods, and lgorithms", Wiley Interscience, 2003.

2. Ian Witten, Eibe Frank, Data Mining; Practical Machine Learning Tools and Techniques, third edition, Morgan Kaufmann, 2011.
3. George M Marakas, Modern Data Warehousing, Mining and Visualization, Prentice Hall, 2003.

WEB REFERENCES

1. http://www.data-miners.com/

SOFT COMPUTING

Prerequisite: Probability and Statistics, Vectors, C++/Java/ Matlab programming

Learning Objective:
1. To study the techniques of soft computing, especially evolutionary computation, fuzzy logic, GA and neural networks.
2. Applying hybrid of multiple techniques and choosing the appropriate technique for the problems that one want to solve.

Learning Outcome:
1. Applying soft computing techniques to solve real world problems.

UNIT –I:INTRODUCTION AND ARTIFICIAL NEURAL NETWORK (12 Hours)

Introduction to Soft Computing, Historical Development, Definitions, advantages and disadvantages, solution of complex real life problems.

Artificial Neural Network: Introduction, basic models, Hebb's learning, Adaline, Perceptron, Multilayer feed forward network, Back propagation, Different issues regarding convergence of Multilayer Perceptron, Competitive learning, Self-Organizing Feature Maps, Adaptive Resonance Theory, Associative Memories, Deep Neural Network, Applications.

UNIT –II: FUZZY LOGIC (12 Hours)

Fuzzy Logic: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of ClassicalSets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment,Intersections, Unions, Combinations of Operations, Aggregation Operations. FuzzyArithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals &Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

UNIT –III: GENETIC ALGORITHMS (12 Hours)

Evolutionary and Stochastic techniques: Genetic Algorithm (GA), different operators of GA, analysis of selection operations, Hypothesis of building blocks, Schema theorem and convergence of Genetic Algorithm, Simulated annealing and Stochastic models, Boltzmann Machine, Applications.

UNIT –IV: HYBRID SYSTEMS (12 Hours)

Hybrid Systems: Neural-Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications.

TEXT BOOKS:

1. Jang, "Neuro-Fuzzy and Soft computing", Sun, Mizutani, Pearson
2. Haykin, "Neural networks: a comprehensive foundation",
3. Goldberg, "Genetic Algorithms",
4. G.J. Klir& B. Yuan, "FuzzySets& Fuzzy Logic", PHI.

REFERENCE BOOKS:

1. Anderson J.A., "An Introduction to Neural Networks", PHI, 1999
2. Hertz J. Krogh, R.G. Palmer, "Introduction to the Theory of Neural Computation", Addison-Wesley, California,

3. Melanie Mitchell, "An Introduction to Genetic Algorithm", PHI, 1998.
4. "Neural Networks-A Comprehensive Foundations", Prentice-Hall International, New Jersey, 1999.
5. Freeman J.A. & D.M. Skapura, "Neural Networks: Algorithms, Applications and Programming Techniques", Addison Wesley, Reading, Mass, (1992).

CRYPTOGRAPHY AND NETWORK SECURITY

Category: Programme Core Course

Prerequisite: Fundamental of computer science and mathematics

Learning Objective:

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to lPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message.
- Discuss Web security and Firewalls

Learning Outcome: Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues. Ability to identify information system requirements for both of them such as client and server. Ability to understand the current legal issues towards information security.

UNIT I : Classical Encryption Techniques(12 Hours)

Introduction: Cryptography, cryptanalysis, Security attacks, services & mechanisms, Symmetric Cipher Model, Substitution Techniques, Transportation Techniques, Cyber threats and their defense (Phishing Defensive measures), web based attacks, SQL injection & Defense techniques, Buffer overflow & format string vulnerabilities, TCP session hijacking (ARP attacks, route table modification) UDP hijacking (man-in-the-middle attacks).

UNIT II: Block Ciphers , Symmetric Key Cryptography & Asymmetric Key Cryptography (12 Hours) Traditional Block Cipher Structure, DES,Triple DES, Block Cipher Design Principles, AES-Structure, Transformation functions, Key Expansion, Blowfish, IDEA, Block Cipher Modes of Operations. Public Key Cryptography: Principles, public key cryptography algorithms, RSA Algorithms, Diffie Hellman Key Exchange, Elliptic Curve Cryptography

UNIT III : Cryptographic Hash Functions & Digital Signatures(12 Hours)

Message authentication and Hash Functions, Authentication Requirements and Functions, Message Authentication, Hash Functions and MACs Hash and MAC Algorithms SHA-512,

HMAC, Digital Signatures, NIST Digital Signature Algorithm.Key management & distribution. User Authentication: Remote user authentication principles, Kerberos

UNIT IV: User Authentication, Transport Layer Security & Email Security IP Security & Intrusion Detection Systems (12 Hours)

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Shell(SSH) Electronic Mail Security: Pretty Good Privacy (PGP) and S/MIME.
IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management. Firewalls:Need for Fire wall,Types of Firewall , Firewall Designing principle

TEXT BOOKS

1. Cryptography & Network Security: Principles and Practices, William Stallings, PEA, Sixth edition.
2. Introduction to Computer Networks & Cyber Security, Chwan Hwa Wu, J.David Irwin, CRC press
3. Hack Proofing your Network, Russell, Kaminsky, Forest Puppy, Wiley Dreamtech.

REFERENCE BOOKS

1. Everyday Cryptography, Fundamental Principles & Applications, Keith Martin, Oxford
2. Network Security & Cryptography, Bernard Menezes, Cengage,2010

MINOR PROJECT CS 6701

Student may choose any research or application based topic for the minor project. The minor project can be done by individual or maximum of four persons. Student has to submit a report.

SUMMER INTERNSHIPCS 6401

Summer internship is planned to expose students to industrial practices. Students have to correlate the theory learnt in classroom to the procedures adopted in industry. Students have to maintain a dairy on the work carried out in industry and submit a detailed report of her/his experience at the industry.

Semester-VIII

MACHINE LEARNING

Category:	Programme Core Course
Prerequisite:	Fundamental of computer science and mathematics
Learning Objective:	To introduce concepts of learning.. To know decision tree learning and various learning methods.
Learning Outcome:	This course enables us to understand the concepts of machine learning and its applications.

UNIT – I: (12Hours)

General Introduction: Learning Problems, Choosing Training experience/Target Function, Representation of the target function, issues in machine learning.

Concept Learning: Concept learning task-Inductive Learning, Concept Learning as search, FIND-S algorithm, version spaces, The List then Eliminate algorithm, Representation of version spaces, The Candidate Elimination algorithm, Inductive bias.

UNIT – II: (12 Hours)

Decision Tree Learning: Decision tree representation, ID3 Learning algorithm, Entropy, Information gain, over fitting, reduced error pruning, Rule-post pruning.

Bayesian Learning: Bayes' Theorem and concept Learning, Bayes optimal classifier, Bayesian Belief Network.

UNIT – III: (12Hours)

Instance based Learning: Introduction, k-Nearest Neighbour Learning algorithm, distance weighted nearest neighbour learning algorithm, case based reasoning, lazy learner and eager learner.

Learning Set of Rules: Sequential covering algorithm, First Order Inductive Learning (FOIL), Induction as inverted deduction, Inverting resolution (First order resolution), Generalisation, theta-subsumption and entailment, PROGOL.

UNIT – IV:(12Hours)

Analytical Learning: Inductive vs Analytical Learning, Prolog-EBG, Combining inductive and analytical learning.

TEXT BOOKS

1. Tom M. Mitchell, Machine Learning, Mac Graw Hill

REFERENCE BOOKS:

2. Christopher M. Bishop, Machine Learning and Pattern Recognition, Springer

MAJOR PROJECT CS 6702

Student may choose any research or application based topic for the major project. The major project can be done by individual or maximum of four persons. Student has to submit a report.

The project work may be an extension of mini project or can be an independent.

COMPREHENSIVE VIVA-VOCE CS 6601

Comprehensive viva is intended to train students to face interviews. Students are expected to prepare fundamentals in all core subjects of their branch for taking comprehensive viva.

Open Elective-I

ETHICS, INTEGRITY AND ATTITUDE

Category:	Open Elective Course
Prerequisite:	Basic knowledge in Indian culture and values
Learning Objective:	To acquaint the students with the Indian Ethos & Values for taking better managerial decisions for the organisation and knowledge about corporate governance.
Learning Outcome:	Upon successful completion of this course students will have the idea about the culture and ethical issues prevailing in the society.

UNIT – I:(10 hours)

Meaning, Insights into Indian Ethos,Model of management in the Indian Socio-political environment; workethos, Indian heritage in production and consumption; Indian insight into TQM, Corporation, definition and characteristics, history of corporate form and models, corporate objectives, corporations and government, Problems relating to stress in corporate management-Indian perspective, corporate governance,definition, perspectives, Models of CG

UNIT – II: (10 hours)

Business Ethics and CSR**:** Corporation as a social institution, accountability and sustainability, relevance of triple bottom line reporting to CSR, codes of conduct, applications of ethical theories to decision making, ethical issues related to employment, healthcare and advertisement Engineering Ethics:Senses of Engineering Ethics, variety of moral issues, types of inquiry, moral dilemmas, moral autonomy.

UNIT – III: (10 hours)

Values for managers; holistic approach for managers in decision making; secular versus spiritual values inmanagement; personal growth and lesions from ancient Indian educational system; science and human values, Teaching Ethics; trans-cultural human values in management education; relevance of values in management; need for values in global change – Indian perspective.Global Issues:Multinational corporations, environmental ethics, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership.

TEXT BOOK

1. Chakraborty, S.K. : Foundations of Managerial Work – Contribution from Indian Thought, Himalaya
Publishing House, Delhi 1998.

2. Drucker, P : Managing in Turbulent Times, Pan Books London, 1983.
3. Kumar, S and N.K. Uberoi: Managing secularism in the New Millenium, Excel Books 2000.

ORGANIZATIONAL BEHAVIOUR

Category:	Open Elective Course
Prerequisite:	Basic knowledge in communication and management
Learning Objective:	The objectives of this paper are to familiarize the student with basic management concepts and behaviouralprocesses in the organization and job field. Students will be able to examine group and individual behaviour.
Learning Outcome:	Upon successful completion of this course students will have the ability to discuss, develop and analyse the organisational changes, culture and development.

UNIT – I: FOCUS AND PURPOSE AND INDIVIDUAL BEHAVIOUR (10 hours)

Definition, need and importance of organizational behaviour – Nature and scope – Frame work – Organizational behaviour models.Personality – types – Factors influencing personality – Theories. Learning – Types of learners – The learning process – Learning theories
Organizational behaviour modification.Misbehaviour – Types – Management Intervention.Emotions - Emotional Labour – Emotional Intelligence – Theories.

UNIT – II: ATTITUDES (8 Hours)

Attitudes – Characteristics – Components – Formation – Measurement- Values. Perceptions – Importance – Factors influencing perception – Interpersonal perception- Impression Management.Motivation – importance – Types – Effects on work behavior.

UNIT – III: GROUP BEHAVIOUR, LEADERSHIP AND POWER (12 hours)

Organization structure – Formation – Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Team building - Interpersonal relations – Communication – Control.Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics.

UNIT – III: DYNAMICS OF ORGANIZATIONAL BEHAVIOUR(10 hours)

Organizational culture and climate – Factors affecting organizational climate – Importance.Job satisfaction – Determinants – Measurements – Influence on behavior.Organizational change – Importance – Stability Vs Change – Proactive Vs Reaction change – the change process – Resistance to change – Managing change.Stress – Work Stressors – Prevention and Management of stress – Balancing work and Life.Organizational development – Characteristics – objectives –. Organizational effectiveness

TEXT BOOKS:

1. Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education.
2. Fred Luthans, Organisational Behavior, McGraw Hill.

REFERENCE BOOKS:

1. Schermerhorn, Hunt and Osborn, Organisational behavior, John Wiley.
2. UdaiPareek, Understanding Organisational Behaviour, Oxford Higher Education.
3. Mc Shane & Von Glinov, OrganisationalBehaviour, Tata McGraw Hill.

4. Hellrigal, Slocum and Woodman, Organisational Behavior, Cengage Learning

PERSONALITY DEVELOPMENT

Category:	Open Elective Course
Prerequisite:	Basic knowledge about business communication and language.
Learning Objective:	A person's personality is defined by their characteristics, behaviors, thoughts, and feelings. These aspects startdeveloping during childhood, and are strengthened and molded as the person grows. This study nurtures the student and grooms their personality
Learning Outcome:	The students will be able to groom and develop etiquettes for presenting themselves in a professional manner.

UNIT – I :(10 Hours)

Self Awareness:Know yourself, have a snapshot of yourself, assess yourpersonal traits, discover natural potential. Activities and Tasks: Classdiscussion, questionnaires, Johari Window, SWOC analysis (strengths,weaknesses, opportunities and challenges).

UNIT – II :(10 Hours)

Self Discipline:Importance of self-discipline, characteristics of a self-disciplined achiever, self-discipline in personal life and career. Activitiesand Tasks: Viewing short videos followed by discussion and analysis,brainstorming in small groups, creating an action plan to realize academicand career goals.

UNIT – III : (10 Hours)

Motivating Oneself:Self-motivation, confidence building, goal setting,decision making. Activities and Tasks: Discussion and analysis of casestudies, completing self-assessment questionnaires, Handling emotions, time management, stress management,change management. Activities and Tasks: Discussion and analysis
of case studies, completing self-assessment questionnaires.

UNIT – IV :(10 Hours)

Interpersonal Behaviour:Attitude towards persons and situations, teamwork, leadership skills, problem solving skills, interpersonal adaptability,cultural adaptability.Importance of Corporate communication - Introduction to and definition of corporates – Communication, process, patterns and channels of communication- Barriers to communication and strategies to overcome them- Evolution of corporate culture- Role and contribution of individual group and organization - Role of psychology in communication.

TEXT BOOK:

1 Personality Development and Soft Skills – Oxford University Press by Barun K. Mitra

REFERENCE BOOK:

1. Personality Development – Goodwill Publishing House by Harsh Kumar

PUBLIC ADMINISTRATION

Category:	Open Elective Course
Prerequisite:	NA
Learning Objective:	To introduce concepts of administrative Thought. To introduce the concept of accountability and Control. To know union and State Governments Administration
Learning Outcome:	This course enables students to understand public administration.

UNIT I (10 Hours)

Introduction: Meaning, scope and significance of public administration, evolution of the discipline and its present status, challenges of liberalisation, privatization and globalization, good governance, electronic governanceconcepts and applications, New Public Management (NPM).

UNIT II(10 Hours)

Administrative Thought: Scientific management theory, classical theory, bureaucratic theory, human relations theory, system theory.

UNIT III(08 Hours)

Accountability and Control: Legislative, executive and judicial control over administration, role of media, interest groups, NGOs, civil society, Right to Information Act (RTI), social audit, citizen chapters.

UNIT IV (12 Hours)

Union and State Governments Administration: President, prime minister, council of ministers, cabinet, central and state secretariats, boards and commissions, governor, chief minister and council of ministers, central- state relations, finance commission, Neeti ayog. Civil Services: Recruitment, training and other condition of services, district dministration, role of collector, local self-governing institutes-73rd and 74th constitutional amendments act.

TEXT BOOKS

1. Avasti, Maheswari, Public Administration, 31/e, Lakshmi Narain Agarwal Books, India, 2014.
2. B. L. Fadia, Kuldeep Fadia, Indian Administration, 8/e, Sahitya Bhawan, India, 2014.

REFERENCE BOOKS

1. Nicholas Henry, Public Administration and Public Affairs, 21/e, Prentice Hall of India, 2012.
2. D. Ravindra Prasad, ?V. Sivalinga Prasad, ?P. Satyanar?yana, Administrative Thinkers, 2/e, Sterling Publishers, 1991.
3. D. D. Basu, Introduction to the Indian Constitution, 21/e, Lexis Nexis Butterworths, Wadhwa Nagpur, 2013.
4. Ramesh K. Arora, Rajni Goyal, Indian Public Administration, 3/e, New Age International Publishers, India, 1995.

PHILOSOPHICAL FOUNDATIONS OF EDUCATION

Category:	Open Elective Course
Prerequisite:	NA
Learning Objective:	To introduce concepts of Philosophical Concepts Related to Education. To introduce the concept of Knowledge and Wisdom. To know Purposes of Education
Learning Outcome:	This course enables students to understand philosophical foundation of education.

UNIT I **(10 Hours)**

Introduction: Philosophy's relevance to education; Philosophical roots of education, education as transmission of knowledge, education as the fostering of inquiry or reasoning skills, education as an agent of social change or personal liberation, liberal education and vocational education.

UNIT II (10 hours)

Philosophical Concepts Related to Education: Indian: from the vedicto the modern - an overview; Western: an overview - metaphysics – naturalism or supernaturalism; Epistemology - reason or faith; Human nature - dualism, reductive materialism or integrationism; Ethics - egoism, predation or altruism; Idealism, Realism, Pragmatism, Behaviorism, Existentialism.

UNIT III **(10 hours)**

Knowledge and Wisdom: Interrelation between education, science, technology, society and environment, Galileo to today-an overview.Purposes of Education: Personal growth or self-improvement, intellectual purposes, political purposes, economic purposes such as job preparation, social purposes such as the development of social and moral responsibility.

UNIT IV (10 hours)

A Few Thinkers on Education and their Impact on Education: Eastern and western-Confucius, Socrates, Plato, Aristotle, Michel Foucault, Bertrand Russel, Rabindranath Tagore, Sri Aurobindo, Swami Vivekananda, J. Krishnamurti, S. Radhakrishnan, M.K. Gandhi.

REFERENCE BOOK

1. Sharma, A.P., Indian and Western Educational Philosophy, Pustak Mahal, 2010.
2. Ozmon, Howard, Philosophical Foundations of Education, Prentice-Hall, 2011.
3. Palmer Joy, Bresler Liora, Cooper David, Fifty Major Thinkers on Education: From Confucius to Dewey, Routledge, 2001.
4. Noddings N., Philosophy of Education, Boulder, CO, Westview Press, 1995.
5. Gailbraith D., Analyzing Issues: Science, Technology and Society, Trifolium Books. Inc., Toronto, 1997.

SCIENCE AND TECHNOLOGY

Category:	Open Elective Course
Prerequisite:	NA
Learning Objective:	To introduce concepts of planet earth. To introduce the concept of computer and communication. To know material and processing.
Learning Outcome:	This course enables students to understand science and technology.

UNITI **(10 hours)**

Planet Earth: Introduction, the crust in motion, earth quakes, mineral future, promise of oceans, changing climate, green house effect, global environmental issues, meteorological science, preserving mother earth. Living State: Introduction, molecular genetics, cell biology, immunology, neuro sciences, biology and agriculture, storage of food grains, agriculture products and their preservation, biotechnology in food processing.

UNIT II **(10 hours)**

Energy: Introduction, some important time perspectives, mid-term energy options, mid-term supply strategies, hydro, wind, thermal, solar and nuclear energies, environmental and health effects in harvesting energy, long term
energy options, some research needs.

UNIT III(10 hours)

Computer and Communications: Introduction, development of communication system, telegram, telephone, wireless communication, current technology and systems, theoretical computer science and contribution from mathematics, computer and communications, artificial intelligence, television and entertainment.

UNITIV **(10 Hours)**

Materials and Processing:Materials in ancient India, development in materials, materials processing and manufacturing: recent concepts in materials, polymer materials, composites, nano sciences and nano technologies, super conductivity, laser and photonics.

TEXT BOOK

1. Ashok Singh, Science and Technology, 2/e, Access Publishing, 2014.
2. WH Freeman and Company, National Academy of Sciences, Washington D.C., 1979.

REFERENCE BOOK

1. K D Sharma, M. A. Qureshi, Science, Technology and Development, Sterlings Publishers Pvt. Ltd., New Delhi, 1978.
2. B. R. Nanda (Editor), Science and Technology in India, Vikas Publishing House Pvt Ltd,1977.

Open Elective-II

INDIAN CONSTITUTION

Category:	Open Elective Course
Prerequisite:	NA
Learning Objective:	To introduce concepts ofIndian Constitution. To introduce the concept ofRights and Duties. To know State and Local Governments.
Learning Outcome:	This course enables students to understand Indian Constitution.

UNIT I (10 Hours)

Introduction to Indian Constitution: Constitutional history, constituent assembly, salient features of the constitution, significance of preamble, amending process of the constitution. Rights and Duties: Citizenship, fundamental rights and directive principles, fundamental duties.

UNIT II (10 Hours)

Union Government: President and vice president, election, removal and powers, prime minister and council of ministers, parliament, supreme court, union, state relations, emergency provisions.

UNIT III (10 Hours)

State and Local Governments: Governor, state legislature, assembly and council, chief minister and council of ministers, high court, rural and urban local governments with special reference to 73rd and 74th constitutional amendment acts.

UNIT IV (10 Hours)

Other Constitutional and Statutory Bodies: Comptroller and auditor general, election commission, finance commission, attorney general and advocate general, union public service commission (UPSC), state public service commissions (SPSCs), tribunals, national human rights commission (NHRC).

TEXT BOOKS

1. J. C. Johari, Indian Government and Politics, Vishal Publications, Delhi, 2010.
2. M. V. Pylee, Introduction to the Constitution of India, 5/e, Vikas Publishing House, Mumbai, 2009.

REFERENCE BOOKS

1. D.D. Basu, Introduction to the Indian Constitution, 21/e, Lexis Nexis, Gurgaon, India.
2. Subhas C. Kashyap, Our Constitution, 2/e, National Book Trust India, New Delhi.

PROFESSIONAL WRITING AND COMMUNICATION

Category:	Open Elective Course
Prerequisite:	Basic knowledge about English language andcommunication
Learning Objective:	Professional writing typically has a formal tone and differs from written text that is considered literary or artistic. The general purpose of professional writing is to convey information to readers within a workplace context.

Learning Outcome:	The students will attain the knowledge about importance of proper communication and its methods.It would nurture the students about technicalities in communication as well as the attitude can be measured.

UNIT- I **(10 hours)**

Grammar Principles and Vocabulary Building: -Exposure to basics of grammar- parts of speech, with emphasis on tenses—active and passive voice- their usage- reported speech -Idioms and Phrases—their meanings and usage, Vocabulary development through prefixes, suffixes and word roots

UNIT- III **(10hours)**

Effective Sentence Construction –clarity and precision in construction—strategies for effectiveness in writing. Paragraphs: Definition- structure- Types and Composition-unity of theme- coherence-organization patterns**:** Memo-structure, layout and style, e-mail-structure,style, content and etiquette, notice-structure, content and layout

UNIT- III **(10hours)**

Letter Writing: Business, Official and Informal letters-- communicative purpose-strategy- letter format and mechanics- letters of request , complaint and invitation-

Reading techniques: Skimming and Scanning – quick reading for gist and –suggesting titles-looking for specific information

Description of Graphics- kinds of graphs- their construction and use and application in scientific texts- interpretation of graphs using expressions of comparison and contrast

UNIT- IV(10hours)

Reading Comprehension – reading to retrieve information ——techniques of comprehension -find clues to locate important points- answering objective type questions – inference, elimination Technical Report-Writing - kinds of reports-proposals, progress and final reports- their structure-features- process of writing a report-editing Resume, Cover Letter, Interview and Telephone Etiquette: Resume, designand structure, cover letter, cover letters, accompanying resumes, opening,body, closing; Interview, planning, purpose, pre-interview preparation,conversation, two-way interaction, projecting a positive image, telephoneetiquette-guidelines for telephone conversations in a professional context.

TEXT BOOKS

1. Basic Business Communication – Lesikar- TMH

REFERENCE BOOKS

1 Business Communication – BoveeThill, J. Schatzman – Pearson Edu.
2 Business Correspondence & Report writing – Sharma, Mohan – TMH
3 The Essence of Effective Communication – Ludlow, R. &Panton,F. – Prentice Hall ofIndia Pvt. Ltd

INDIAN ECONOMY

Category:	Open Elective Course
Prerequisite:	NA
Learning Objective:	To introduce Structure of Indian Economy. To introduce the concept of Demography, Poverty and Unemployment in India. To know Public Finance.
Learning Outcome:	This course enables students to understand Indian Economy.

UNIT I (10 hours)

Structure of Indian Economy: Meaning of economic growth and development, features of Indian economy, changing structure of Indian economy, trends in national income, sources of growth, agriculture, industry and
service sectors.

UNIT II (10 hours)

Demography, Poverty and Unemployment in India: Demography: Population size and growth rates, age and gender distribution, trends of urbanization, occupational distribution of labour force. Poverty: Nature of poverty causes for poverty, measures to eradicate poverty. Unemployment: Nature and types of unemployment, causes for unemployment, remedial measures of unemployment.

UNIT III (12 hours)

Public Finance: Sources of government revenue, Indian tax structure, direct and indirect taxes, composition of the government expenditure, role of monetary and fiscal policies, federal finance in India, 14th finance commission.Foreign Trade: Importance, composition and direction of foreign trade, foreign direct investment, BoPs equilibrium, Foreign Exchange Management Act (FEMA).

UNIT IV (8 hours)

Economic Reforms in India: Industrial policy 1991, economic reforms, liberalization, privatization, and globalization.

TEXT BOOK(S)

1. V. K. Puri, S.K. Misra, Indian Economy, 31/e, Himalaya Publishing House, 2014.

REFERENCE BOOKS

1. R.C. Dutt, K.P.M. Sundaram, Indian Economy, S. Chand and Company, 2010.
2. A. N. Agarwal, Indian Economy, New Age International Limited, 2012.
3. I.C Dhingra, Indian Economy, Sultan Chand and Company, 2007.

INDIAN HISTORY

Category:	Open Elective Course
Prerequisite:	NA
Learning Objective:	To introduce Ancient Indian History and Culture. To introduce the concept of Medieval Indian History and Culture. To know The Rise of Indian National Movement.
Learning Outcome:	This course enables students to understand Indian History.

UNIT I(10 hours)

Ancient Indian History and Culture (Earliest Times to 700 AD): Indus valley civilisation, origin, significance. art and architecture, aryans and vedic period, expansions of Aryans in India, significance of the vedic age, evolution of monarchy and varna system, political conditions and administration under Mauryas, Guptas, social and economic conditions in ancient India, philosophy and religions in ancient India.

UNIT II (10 hours)

Medieval Indian History and Culture: Delhi sultanate, great mughals, bahumanis, rise of south supremacy and conflicts, Pallava, Chalukya, Chola and Rasthrakutas. Modern Indian History and Culture: European penetration into India, the Portuguese and the Dutch, the English and the

French east India companies, their struggle for supremacy, the battle of Plassey and its significance, consolidation of British rule in India.

UNIT III **(10 hours)**

Impact of British Colonial Rule: Economic: Commercialization of agriculture, dislocation of traditional trade and commerce, de-industrialisation, decline of traditional crafts, drain of wealth, famine and poverty in the rural interior. Social and Cultural Developments: The state of indigenous education and its dislocation, orientalist, anglicist controversy, introduction of western education in India, the rise of print media, literature and public opinion, the rise of modern vernacular literature, progress of science, rail and road connectivity.

UNIT IV **(10 hours)**

The Rise of Indian National Movement: Indian response to British rule, the great revolt of 1857, the peasant movements of the 1920s and 1930s, the foundation of the Indian national congress, the moderates and extremists, the partition of Bengal (1905), the swadeshi movement in Bengal, the economic and political aspects of swadeshi movement. Gandhian nationalism: Gandhi's popular appeal, Rowlett Act, satyagraha, the Khilafat movement, the non-cooperation movement, civil disobedience movement, Simon commission, the peasant and working class movements, Cripps mission, the quit India movement, declaration of independence. 175

TEXT BOOK(S)

1. Romila Thapar, A History of India, Vol. I, Penguin Books, 2013.
2. R.C. Majumdar, The History and Culture of the Indian People: Volume 1, The Vedic Age, Bharatiya Vidya Bhavan, 2010.
3. B. L. Grover, Modern Indian History: From 1707 to the Modern Times, S. Chand, 1998.
4. R.C. Majumdar, History of the Freedom Movement in India, South Asia Books, 1988.

REFERENCE BOOKS

1. D. N. Jha, Ancient India in Historical Outline, Manohar Publishers and Distributors, 2001.
2. G. S. Chabra, Advanced Study in the History of Modern India, Lotus Press, 2007.
3. M.K. Gandhi, Hind Swaraj: Indian Home Rule, Sarva Seva Sangh Prakashan, Varanasi, 2014.
4. W. W. Hunter, History of British India, Read Books Design, India, 2010.
5. A. R. Desai, Social Background of Indian Nationalism, 6/e, Popular Prakashan, 2005.

INDIAN NATIONAL MOVEMENT

Category:	Open Elective Course
Prerequisite:	NA
Learning Objective:	To know Rise of Organized Movements. To introduce the concept Gathering Momentum. To know The Rise of Indian National Movement.
Learning Outcome:	This course enables students to understand Indian National Movement.

UNIT I **(10 hours)**

Background: Early British colonialism in India, early rebellions-Pazhassi Raja (the cotiote war - Kerala, 18th century), Veerapandiyan Kattabomman (Tamilnadu/Madras Presidency - 18th century), Paik rebellion (Kalinga/ Odisha, early 19th century), Vellore mutiny (early 19th century); The Sepoy Mutiny of 1857 and its consequences.

UNIT II **(10 hours)**

Contributory Factors: Socio-political consciousness, growth of Western education and its impact on socio-religious movement, British economic policies and their impact. Rise of Organized Movements: Emergence of Indian national congress, its policies and programmes, partition of

Bengal, rise of radical nationalists, Bal-Lal-Pal, formation of the Muslim league; Minto-Morley reforms, the national movement during the first world war.

UNIT III **(10 hours)**

Gathering Momentum: Non-cooperation and civil disobedience, emergenceof Gandhi, some prominent revolutionaries - Khudiram Bose, Prafulla Chaki, Bhupendra Nath Dutt, V.D. Savarkar, Sardar Ajit Singh, Lala Hardayal, Sardar Bhagat Singh, Raj Guru, Sukh Deo, Chandra Shekhar Azad, development of socialist ideas, communal divide.

UNIT IV **(10 hours)**

Towards Independence: Constitutional developments, provincial elections, quit India movement and after, participation of women, national movement during the second world war, Indian national army, naval mutiny of 1946, freedom and partition, impact on the world.

TEXT BOOKS

1. K. Majumdar, Advent of Independence, Bhartiya Vidya Bhavan, Mumbai, 1969.
2. R. Desai, Social Background of Indian Nationalism, 5/e, Popular Prakashan, Mumbai, 1976.

REFERENCE BOOKS

1 Bandyopadhyay, Sekhar, Nationalist Movement in India: A Reader, Oxford University Press, 2008.
2 Chandra, Bipin, Nationalism and Colonialism in Modern India, Orient Longman Limited, New Delhi, 1979.

HUMAN RESOURCE MANAGEMENT

Category:	Open Elective Course
Prerequisite:	Basic knowledge about human resources, law and management
Learning Objective:	In a complex world of Industry and Business, Organizational efficiency is largely dependent on the contribution made by the members of the organization. The objective of this course is to sensitize students to the various facets of managing people and to create an understanding of the various policies and practices of human resource management.
Learning Outcome:	The students will have the idea about the development, implementation and recruitment-retention plans in organisation. It gives knowledge about the evaluation procedure and performance management in organisations.

UNIT – I **(10 hours)**

Introduction to Human Resource Management, Objectives, Scope and Significance of HRM, Functions of HRM, Problems and Prospects in HRM, Environmental scanning Concepts and perspectives on human resource management; human resource management in a changingenvironment.

UNIT – II (10 hours)

Human Resource Planning, Analyzing work and designing jobs, Recruitment and Selection, Interviewing Candidates. Corporate objectives,career succession planning; job analysis and role description. Methods of manpower search; attracting and selecting human resources; introduction and socialization.

Unit-III(10 hours)

Human Resource Development, Orientation, Manpower Training and Development, Management Development, Performance Appraisal and Employee Compensation, Factors

Influencing, Employee Remuneration and Challenges of Remuneration, wage determination; employee welfare.

Unit-IV(10 hours)

Industrial Relations, Industrial Disputes and Discipline, Managing Ethical Issues in Human Resource Management, Workers Participation in Management, Employee safety and health, Managing Global Human Resources and Trade Unions International HRM, Future of HRM and Human Resource Information Systems, employeeempowerment.

TEXT BOOKS

1. Aswathappa, K. Human Resource and Personnel Management, Tata McGraw Hill, New Delhi, 1997.
2. De Cenzo, DA & Robins SP. Human Resource Management, 5th ed., New York, John Wiley, 1994.

REFERENCE BOOKS

3. Guy, V & Mattock J. The New International Manager, London, Kogan Page, 1993.
4. Holloway, J. ed. Performance Measurement and Evaluation, New Delhi, Sage, 1995.
5. Monappa, A. &Saiyadain M. Personnel Management, 2nd ed., New Delhi, Tata McGraw Hill, 1996.
6. Garry Dessler and BijuVarkkey ,Human Resource Management, PEA., 2011.
7. Noe&Raymond ,HRM: Gaining a Competitive Advantage, TMH, 2008.
8. Bohlander George W, Snell Scott A, Human Resource Management, Cengage Learning, 2009.

DISASTER MANAGEMENT

Category:	Open Elective Course
Prerequisite:	Basic knowledge about environmental management and ecology.
Learning Objective:	The demand for disaster managers is growing in parallel to the number of natural disasters and crises. Disaster preparedness and disaster management or crisis management belong together and require quite different skills which need to be learned.
Learning Outcome:	On the completion of the course students will be able to understand the management during natural disasters, conduct assessment and health surveillance, knowledge about resources in disaster situation. .

UNIT – I (10 hours)

Introduction to Disasters: Concepts and definitions (disaster, hazard, vulnerability, resilience, risks). Disasters: Classification causes, impacts(including social, economic, political, environmental, health, psychosocialetc.). Differential impacts in terms of caste, class, gender, age, location,disability. Global trends in disasters, urban disasters, pandemics, complexemergencies, climate change.

UNIT – II (10 hours)

Approaches to Disaster Risk Reduction: Disaster cycle its analysis, phases, culture of safety, prevention, mitigation and preparedness communitybased DRR, structural- nonstructural measures, roles and responsibilitiesof community, Panchayati Raj Institutions/Urban Local Bodies(PRIs/ULBs), states, centre and other stake-holders.

UNIT – III(08 hours)

Inter-Relationship Between Disasters and Development: Factors affectingvulnerabilities, differential impacts, impact of development projectssuch as dams, embankments, changes in

land-use etc. Climate change adaptation,relevance of indigenous knowledge, appropriate technology andlocal resources.

UNIT – IV(12 hours)

Hazard and Vulnerability Profile of India Components of Disaster Relief: Water, food, sanitation, shelter, health, waste management institutionalarrangements (mitigation, response and preparedness, DM Act andPolicy, other related policies, plans, programmes and legislation).

Project Work: (Field Work, Case Studies): The project/fieldwork is meantfor students to understand vulnerabilities and to work on reducing disasterrisks and to build a culture of safety. Projects must be conceived creativelybased on the geographic location and hazard profile of the region wherethe college is located. A few ideas or suggestions to be discussed.

TEXT BOOK(S)

1. G.K. Ghosh, Disaster Management, A.P.H. Publishing Corporation,2011.
2. MukeshKapoor, Disaster Management, DhanpatRai, 2012.

REFERENCE BOOKS

1. ParagDiwan, A Manual on Disaster Management, 2007.
2. A. K. Jain, A Practical Guide to Disaster Management, 2013.
3. Nikuj Kumar, Disaster Management, Alfa Publications, 2012.

S **Category:**	Open Elective Course
Prerequisite:	Basic knowledge about Indian Society and Culture.
Learning Objective:	Resolutions constitute an important opportunity for our students to analyze and opine on contemporary social problems that we believe the knowledge of social issues is of importance.
Learning Outcome:	On the completion of the course, students will attain skills that will enable them to think critically and imaginatively about the society and social issues.

UNIT – I : (8 Hours)

Basic principles of management as per ancient Indian Wisdom and insight, Holistic approach, Kaushalam or Excellence at work quality, Quality of work-life and Work Ethics, Essential Features of Indian Ethos and Insight, Intuition in Management, Indian Wisdom and Modern Management, Managerial Effectiveness, Globalisation, High Technology, Ecology, New Marketing Concept, Managerial Effectiveness

UNIT – II: (12 Hours)

TQM: Quality, TQM, Quality Assurance, TQM and Human Values, Three Aspects of TQM, Internal Quality, Problem Solving Tools, Total Involvement of all Japanses Operating Management Ethos, HRD Interventions in TQM, Emphasis on Quality of Life, Focus on Quality of Work Life, TQM and Human Values System, TQM Environment, Value based Holism, Management as Change Agent, Cross functional Self-Managed Teams, , Mission, Vision, Values, Value based TQM of Western Company, Attributes of Support Team Managers, Quality Management, Kaizen Model

UNIT – III: (10 Hours)

Business Ethics and Stress Management:Need for managers, concept behind Business Ethics, what is ethical dilemma, need for ethical values in global change, Indian perspective, trans-cultural human values in management education Definition, types of stress, Causes of stress, positive and negative effect of stress, problem relating to stress in corporate management-Indian perspective, How to cope up with stress, Job burnout.

UNIT – IV: **(10 Hours)**

Corporate social responsibilitySocial responsibility of business, standard of living or life style, ethical policy and process, forces inducing, social responsibility, business and consumer, business and its environments

TEXT BOOKS

1. A study in Business Ethics :Rituparna Raj (Himalaya Publisher)
2. Ethics in Management :S.A.Sherlekar (Himalaya Publisher)

REFERENCE BOOKS

1. Foundation of Managerial Work :S.K.Chakrabory (Himalaya Publisher)
2. Managing in Turbulent Time: P.Drucker(Pan Book)
3. Managing Secularism in new Millennium :S.Kumar and Uberoi(Excel Books)

Interdisciplinary Elective-I

PRINCIPLES OF PROGRAMMING LANGUAGES

Category:	Interdisciplinary Elective Course
Prerequisite:	Na
Learning Objective:	To learn different principles, elementary structures programming languages.
Learning Outcome:	This course enables students to understand principles of programming languages.

UNIT – I:(10 Hours)

Introduction: Characteristics of programming Languages, Factors influencing the evolution ofprogramming language, developments in programming methodologies, desirable features anddesign issues. Programming language processors: Structure and operations of translators,software simulated computer, syntax, semantics, structure, virtual computers, binding andbinding time.

UNIT – II:(10 Hours)

Elementary and Structured Data Types, Structured data type and objects, Sub Program andprogrammer defined data types: Evolution of data types, abstractions, encapsulations,information hiding, sub programmes, abstract data types. Sequence Control; Implicit andExplicit sequence control, sequence control with within expression and statements, recursivesub programmes, exceptionhandling, co-routines,Scheduled sub-programmes, concurrent
execution.

UNIT – III:(10 Hours)

Data control referencing environments, static and dynamic scope, local data local datareferencing environment, shared data: Explicit common environment dynamic scopeparameter passing mechanism.Storage Management: Major run time requirements, storagemanagement phases, static storage management, stack based, heap based storage
management.

UNIT – IV:(10 Hours)

Syntax and translation: General syntactic criteria, syntactic element of a language, stages intranslation, formal syntax and semantics.

Introduction to Functional Programming, Lambda calculus, Data flow language and ObjectOriented language, Comparison in various general and special purpose programminglanguages e.g. Fortran, C, Pascal, Lisp, etc.

TEXT BOOKS:

1. Sebesta, "Concept of Programming Language", Addison Wesley

REFERENCE BOOKS:

1. Terrance W Pratt, "Programming Languages: Design and Implementation" PHI
2. E Horowitz , "Programming Languages", Edition, Addison Wesley
3. "Fundamentals of Programming Languages", Galgotia.

OPTIMIZATION TECHNIQUES

Category:	Interdisciplinary Elective Course

Prerequisite:	Basic Knowledge of Linear Algebra and Matrix Theory.
Learning Objective:	To introduce the fundamental concepts of Optimization Techniques. To make the learners aware of the importance of optimizations in real scenarios and modern application in computer science like AI, Machine learning, sensor network and routing protocol. Optimization methods using calculus have several limitations and thus not suitable for many practical applications. Most widely used optimization method is linear programming which is the main objective of this module. To provide the concepts of various classical and modern methods of for constrained and unconstrained problems in both single and multivariable.
Learning Outcome:	Formulate optimization problems; Understand and apply the concept of optimality criteria for various type of optimization problems Solve various constrained and unconstrained problems in single variable as well as multivariable; Apply the methods of optimization in real life situation like Assignment and Transportation problem, Shortest path problem, Game Theory , Network Scheduling etc.

UNIT – I: Optimization & Simplex Method (10 Hours)

Introduction to Optimization, Classification of Optimization Problem, Classical Optimization Technique, Single –Variable Optimization, Multivariable optimization, Direct Solution, Constrained variation, Lagrange multiplier, linear programming, Standard form of linear programming, Simplex Algorithm, Two Phage of simplex Method, Big M-Method.

UNIT – II: Duality, Assignment & Transpiration (10 Hours)

Formation of dual problems, Important Result in Duality, Dual simplex Method, Mathematical formulation of Assignment problem, Hungarian Method, The travelling Salesman Problem, Transportation Problem, North West Corner Rule, Optimality Test, Difference of Assignment and Transportation problem.

UNIT – III: Integer Programming & Geometric Programming (10 Hours)

Introduction, Importance of Integer Programming Problems, Application, Methods of Integer Programming Problem, Cutting, Search, Cutting Plane, Mixed Integer Programming, Unconstrained Geometric programming, Constrained Minimization, Mixed inequality.

UNIT – IV:Network Scheduling & Game Theory (10 Hours)

Introduction, Rules of Network Construction, Time Analysis, Critical Path Method (CPM), Programme Evaluation and Review Techniques(PERT), Cost Consideration in PERT/CPM, Payoff, Types of Game, The Maxmin – Minimax Principle

TEXT BOOKS:

1 Engineering Optimization, Singiresu S. Rao, New Age International Publisher.
2 Operation Research, KantiSwarup, S Chand & Sons Publisher

REFERENCE BOOKS:

1. Operations Research,Dr. S.D.Sharma
2. Operations Research: An Introduction,H.A. Taha, PHI Pvt. Ltd.

ENGINEERING ECONOMICS& MANAGEMENT

Category:	Interdisciplinary Elective Course
Prerequisite:	Basic knowledge in economics and finance

Learning Objective:	The objective of this course is to acquaint the students with concepts and techniques in Micro-Economic Theory and to enable them to apply this knowledge in decision-making. Emphasis is given to changes in the nature of business firms in the globalization, Macro-economics and management in an organisation.
Learning Outcome:	This course provides a thorough understanding about the economy of the country along with current knowledge about the recent economic trends

UNIT – I:(10 Hours)

Introduction :Nature and scope of Economics - role of wealth, welfare and optimization

Basic concepts - choice, utility, cost, revenue, value, price, wealth, consumption, wants, necessaries, comforts and luxuries.Markets and its structure.

Demand and Supply Analysis : law of demand and supply, Elasticity of demand and supply, price elasticity of demand, factors affecting elasticity of demand, substitution, income and price effects, Consumer preferences and indifference curve analysis, market equilibrium and their shifts,.

UNIT – II: (10Hours)

Production and Cost: Short-run production function and returns to a factor-average marginal relationship, Long run - production function and laws of returns to scale, Production possibility frontier Isoquants: Two input one output model - isoquant analysis, Two input one output model - isoquant analysis, One input two output model.

Cost function and the cost structure of a firm in the short run, Long run cost function.

Price Output Determination: Perfect competition, Monopoly & Oligopoly including break-even points, Price discrimination.

UNIT – III: (10 Hours)

Principles of Management: Importance of management, definition of management, management process, roles of a manager, management, a science or art - management, a profession, functions of management. Accounts: Preparation of Trading, profit & loss and balance sheet.

Capital Market and Investment Decisions: Financing investments, Financial markets, shares, bonds, convertibles, loans, instruments etc., Cost of capital - the equity, preferencedebt, Investment criteria: Pay back, ,ARR, NPV, IRR and Profitability index.

UNIT – IV: (10 Hours)

National Income - concepts and estimation Alternative approaches to national income, GDP,GNP,etc., Measurements of National Income, Significance of National Income estimation and its limitations. Trade, Aid and Development: Balance of payments, Foreign Capital and collaborations - financial and technological, towards a global economy - GATT, WTO, etc

TEXT BOOKS:

1. Adhikary, M. Business Economics, New Delhi, Excel Books, 2000.
2. Baumal, W.J. Economic Theory and Operations Analysis, 3rd ed., New Delhi, Prentice Hall Inc., 1996.
3. Chopra, O.P. Mnagerial Economics, New Delhi Tata McGraw Hill, 1995.
4. Keat, Paul G & Philips K.Y. Young, Managerial Economics, Prentice Hall, New Jersey, 1996.
5. Koutsoyiannis, A Modern Micro Economics, New York, Macmillian, 1991.
6. Tara Chand, Engineering Economics, Vol-1, 13/e, Nem Chand and Brothers,2012.
7. O.P Khanna, Industrial Engineering and Management, 14/e, DhanpatRaiPublications, 2011.

References

1. Maheswari, Engineering and Managerial Economics, 19/e, Sultan Chand andCompany, 2009.
2. Shukla, Grewal, Cost Accounting, 12/e, S. Chand and Company, 2007.
3. L.M. Prasad, Principles and Practice of Management, 8/e, Sultan Chand andSons, 2012.

LAW FOR ENGINEERS

Category:	Interdisciplinary Elective Course
Prerequisite:	Basic knowledge about management and legal system.
Learning Objective:	The course is designed to assist the students in understanding basic laws affecting the operations of business enterprises.
Learning Outcome:	The students will attain knowledge about management and law related to industries. On-going learning and industrial practices will help the students to know the operating legal system.

UNIT – I (10 Hours)

Introduction to Indian Legal system, Sources of law and judicial system, The Indian Contract Act, 1972: essentials of a valid contract, void agreements, performance of contracts,breach of contract and its remedies, Employment contract, Contract interpretation, Contract of indemnity, Law of agency, Employment agreement.

UNIT – II (10 Hours)

Legal documentation including drafting of non-disclosure agreements (NDA), Request for proposals (RFP), collaboration agreements, joint venture agreements, tendering and sub-contracting,the negotiable instruments

UNIT – III (10 Hours)

Intellectual property rights (IPR)- overview, Trade mark, copy-right, patent, Protection in foreign countries.Cyber laws, E-Commerce, E- Governance.

UNIT – IV (10 Hours)

Labour Laws, Provident Funds, Bonus, Taxation- Income Tax, Service Tax, Excise Duty, GST.

TEXT BOOKS

1. Avtar Singh, Company Law, 11th ed. Lucknow, Eastern, 1996.
2. Khergamwala, J.S. The Negotiable Instrument Acts, Bombay, N.M. Tripathi, 1980.
3. Ramaiya, A. Guide to the Companies Act, Nagpur, Wadhwa, 1992.

REFERENCE BOOKS

1. Shah, S.M. Lectures on Company Law, Bombay, N.M. Tripathi, 1990.
2. Tuteja, S.K. Business law for Managers, New Delhi, Sultan Chand, 1998.

STATISTICAL METHODS FOR COMPUTING

Category:	Interdisciplinary Elective Course
Prerequisite:	Basic Mathematics
Learning	To know the concept of probability.

Objective: To introduce the concept of Random Variables & Distributions.
To know Sampling Distribution & Estimation.

Learning Outcome: This course enables students to understand statistical methods for computing.

UNIT – I: Probability (10 Hours)

Frequency distribution, Bar, Histogram, Measures of Central Tendency, Sample Space and Events, Probability, The axioms of probability, Some Elementary theorems, Conditional Probability, Bayes' Theorem

UNIT – II: Random Variables & Distributions (10 Hours)

Discrete and continuous-Distribution- Distribution function, Distribution, Binomial, Poisson and normal Distribution-related properties.

UNIT – III: Sampling Distribution & Estimation (10 Hours)

Population and Samples- Sampling distribution of mean (known and unknown) proportions, sums and differences, Point estimation- interval estimation- Bayesian estimation. Means- hypothesis concerning one and two means- Type-I and Type-II errors, One tail, Two tail tests

UNIT – IV:Tests of Significance & Curve Fitting (10 Hours)

Students' t-test, F-test, Chi-square test, Estimation of proportion, Inference based on the least squares estimation, Regression, multiple regression, correlation for univariate and bivariate distribution. ANOVA.

TEXT BOOKS:

1. Probability and Statistics, Mendenhall and Beaver, Cengage Learning

REFERENCE BOOKS:

1. Fundamentals of Mathematical Statistics, Gupta and Kapoor, Sultan Chand & Sons

Probability and Statistics, Iyengar and Gandhi, S Chand

Interdisciplinary Elective-II

DIGITAL SIGNAL PROCESSING

Category:	Interdisciplinary Elective Course
Prerequisite:	Linear algebra, complex numbers, trigonometry, calculus, signal and systems
Learning Objective:	This course aims to introduce the concepts of digital signal processing and the basic analytical methods, and to show how they are applied to design filters for given applications. Study of key DSP operations such as convolution, filtering, and discrete Fourier transforms, Digital filter design and spectral analysis.
Learning Outcome:	Familiarity with fundamental concepts such as 'linearity' , 'time-invariance','impulse response', 'convolution', 'frequency response', 'z-transforms' and the 'discrete time Fourier transform' as applied to signal processing systems.Ability to design FIR and IIR filters for noise removal applications. Acquired knowledge about discrete-time sequences, concept of energy and power, periodicity.Spectral analysis of signals using DFT and FFT.

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UNIT – I: DISCRETE-TIME SIGNALS AND SYSTEMS (10 Hours)

Discrete-Time Signals: Some Elementary Discrete-Time signals, Classification of Discrete Time Signals, Simple Manipulation; Discrete-Time Systems : Input-Output Description, Block Diagram Representation, Classification,Interconnection; Analysis of Discrete-Time LTI Systems: Techniques, Response of LTI Systems, Discrete-Time Systems Described by Difference Equations; Implementation of Discrete-Time Systems; Correlation of Discrete-Time Signals: Crosscorrelation and Autocorrelation Sequences.

The Z-Transform: The Direct Z-Transform, The Inverse Z-Transform; Properties of the Z-Transform; Inversion of the Z-Transforms: The Inversion of the Z-Transform by Power Series Expansion, The Inversion of the Z-Transform by Partial-Fraction Expansion; Analysis of Linear Time-Invariant Systems in the z-Domain.

UNIT – II: Discrete Fourier Transforms (10 Hours)

Frequency Domain Sampling: Frequency-Domain Sampling and Reconstruction of Discrete-Time Signals, The Discrete Fourier Transform, The DFT as a Linear Transformation, Relationship of the DFT to other Transforms; Properties of the DFT: Periodicity, Linearity, and Symmetry Properties, Multiplication of Two DFTs and Circular Convolution, Additional DFT Properties; Linear Filtering Methods Based on the DFT: Use of the DFT in Linear Filtering, Filtering of Long Data Sequences; Frequency Analysis of Signals using the DFT.

UNIT – III:IMPLEMENTATION OF DISCRETE-TIME SYSTEMS (10 Hours)

Structure for the Realization of Discrete-Time Systems, Structure for FIR Systems: Direct-Form Structure,Cascade-Form Structures, Frequency-Sampling Structures; Structure for IIR Systems: Direct-Form Structures.Causality and Its Implications, Characteristics of Practical Frequency-Selective Filters; Design of FIR Filters:Symmetric and Antisymmetric FIR Filters, Design of Linear-Phase FIR Filters by using Windows, Design ofLinear-Phase FIR Filters by the Frequency-Sampling Method; Design of IIR Filters from Analog Filters: IIR Filter Design by Impulse Invariance.

UNIT – IV: Fast Fourier Transforms (10 Hours)

Efficient Computation of the DFT: FFT Algorithms: Direct Computation of the DFT, Radix-2 FFT Algorithms:Decimation-In-Time (DIT), Decimation-In-Time (DIF); Applications of FFT Algorithms: Efficient Computationof the DFT of two Real Sequences, Efficient Computation of the DFT a 2N-Point Real Sequence, Use of the FFT Algorithm in Linear Filtering and Correlation.

TEXT BOOKS:

1. Digital Signal Processing – Principles, Algorithms and Applications,J. G. Proakis and D. G. Manolakis,Pearson.

REFERENCE BOOKS:

1.Digital Signal Processing, by Oppenheim, Prentice Hall, 1988
2.Digital Signal Processing;S. K. Mitra: TMH,1998
3.Introduction to Digital Signal Processing; S.J.Orfanidis,Prentice-Hall,1996.
4.Digital Signal Processing, byP.Ramesh Babu, Scitech Pub., India.

VLSI DESIGNING

Category:	Interdisciplinary Elective Course
Prerequisite:	Digital circuit System
Learning Objective:	To knowMOS inverters. To introduce the concept Combinational MOS logic circuits. To know VHDL.
Learning Outcome:	This course enables students to understand VLSI Designing.

UNIT – I: INTRODUCTION TO VLSI(10 Hours)

Introduction, historical perspective, VLSI Design methodologies, VLSI Design flow, Design hierarchy, Design styles, CAD Technology. Fabrication of MOSFETS, Fabrication processes, NMOS Fabrication, CMOS n-well process, Layout Design rules, Full Custom Mask Layout Design, MOS Transistor, Review of structure and operation of MOSFET (n-MOS enhancement type), CMOS, MOSFET V-I characteristics, MOSFET scaling and small geometry effects, MOSFET capacitances, Modeling of MOS transistors using SPICE- Basic concept, SPICE level – 1 models, level – 2 and level – 3 model equations.

UNIT – II: MOS INVERTERS(10 Hours)

Basic NMOS inverters, characteristics, inverters with resistive load and with n-type MOSFET LOAD, CMOS Inverter and characteristics. MOS Inverters: switching characteristics and interconnect effects : Delay time definitions and calculation, inverter design with delay constraints, estimation of parasitic switching power dissipation of CMOS inverters.

UNIT – III: COMBINATIONAL AND SEQUENTIAL MOS LOGIC CIRCUITS (10 Hours)

Combinational MOS logic circuits: CMOS logic circuits, complex logic circuits, pass transistor logic. Sequential MOS logic circuits: introduction, SR latch, clocked latch & flip-flop circuits, CMOS D latch and edge triggered flip-flop. Dynamic logic circuits: Dynamic logic, basic principles, high performance dynamics CMOS circuits, Dynamic RAM, Static RAM, Flash memory.

UNIT – IV:INTRODUCTION TO VHDL(10 Hours)

Introduction to VHDL, Behavioral modeling, sequential processing, Data types, IEEE std logic, VHDL operators, arrays, Modules, packages, libraries. VHDL description of combinational logic circuits, VHDL description of sequential logic circuits. Modeling of flip-flops, registers, and counters using VHDL. VHDL code for serial adder, and binary multiplier.

TEXT BOOKS:

1. CMOS Digital Integrated Circuits – Analysis & Design – Sung -Mo Kang &YussufLeblebici, TMH.
2. Basic VLSI Design by Douglas A Pucknell and Kamran Eshraghian, PHI, 3rd edition.
3. VHDL Programming by example – Perry TMH.

REFERENCE BOOKS:

1. VLSI Design Techniques for analog and digital circuits – Geiger et. Al. McGraw Hill.
2. Digital Integrated Circuits : A Design Perspective – Rabey et.al. Pearson Education.

INFORMATION THEORY AND CODING

Category:	Interdisciplinary Elective Course
Prerequisite:	Basics of probability theory
Learning Objective:	To impart the knowledge of various error detection and correction coding techniques used in signal transmission.
Learning Outcome:	Students will able to understand various error detection and correction coding techniques and how the errors can be detected and corrected at the receiver side after the information is transmitted through the medium.

UNIT – I:INFORMATION THEORY AND SOURCE CODING (10 Hours)

Introduction to Information Theory, Uncertainty and Information, Mutual Information and Entropy,Source Coding, Huffman Coding, Shannon-Fano-Elias Coding, Arithmetic Coding, Lempel-ZivAlgorithm, Run Length Encoding, Channel Capacity, Channel Coding, Information Capacity Theorem,The Shannon Limit.

UNIT – II:ERROR CONTROL CODING (CHANNEL CODING) (10 Hours)

Error Correcting Codes, Matrix Description of Linear Block Codes, Equivalent Codes, Parity CheckMatrix, Syndrome Decoding, Perfect codes, Hamming Codes, Cyclic Codes, Brust Error Correction,Fire Codes, Golay Codes

UNIT – III:BCH, CONVOLUTION AND TRELLIS (10 Hours)

Bose-ChaudhriHocquenghem (BCH) codes, Decoding of BCH codes, Reed-Solomon Codes,Convolution Codes, Polynomial description , Turbo Codes , Turbo Decoding, Introduction to TCM,Performance Evaluation forAEGN Channel.

UNIT – IV:COMPRESSION TECHNIQUES, AUDIO AND VIDEO CODING (10 Hours)

Principle of Data Compression, Text Compression, Image Compression (GIF, TIFF,JPEG), Image AudioCoders, Videp Compression, MPEG Video Standards (MPEG 1,2,3 and MP-3 Standrad Sounds.

TEXT BOOKS

1. Information Theory, Coding and Cryptography, Ranjan Bose 2nd Edition, The McGraw-Hill.

REFERENCE BOOKS:

1.Information theory and Coding, Norman Abramson, McGraw-Hill electronic Seriesr.
2.Information Coding Techniques, Dr. J. S. Chitode, Technical Publication.

STOCHASTIC PROCESSES

Category:	Interdisciplinary Elective Course
Prerequisite:	First level course on Probability & Statistics.
Learning Objective:	An introduction to probability theory and stochastic models, as they apply to computer science. Key terms are random variables, probability distributions, sampling theory, random samples, etc. It will also consider Markov chains, a particular stochastic process that is frequently applied in stochastic modeling of computer and communication systems.
Learning Outcome:	Students will able to understand stochastic models.

UNIT I: (10 Hours)

Course Contents: Probability Preliminary: Axiomatic approach of probability, Random variable- characteristics- mean, Variance, distribution function, E and V- operators, moment generating function (MGF) and characteristic function, function of multi-dimensional random variable. Probability distributions: Discrete distributions: Binomial, Pascal, and Poisson- establishment and analysis

UNIT II: (10 Hours)

Continuous distributions: Exponential, normal, lognormal, gamma and Weibull distributions and analysis-properties and limiting form, approximations. Sampling Theory, Random Samples, Sampling Distributions, Estimation of parameters, Test of hypotheses on the Mean, Type I error, Type II Error, Test of Hypothesis on the equality of Two Means, Test of Hypothesis on a variance, Test of Hypothesis on the Equality of Two variances, Goodness of fit test

UNIT III: (12 Hours)

Pure birth process, Assumptions, derivation; birth and death queuing models- single and multiple Server queuing models- queues with finite waiting- finite source models, steady state measures Markov Chains – Introduction, Transition Probabilities, Homogeneous Markov Chains, Transition Probability Matrix, Initial Distribution, Absorbing States, Communication between States, Irreducible Markov Chains, Steady State.

UNIT IV: (8 Hours)

Vector. Limitations of Markov process, Semi-Markov chains- establishment, transformation, system effectiveness prediction, Hidden Markov models (conceptual treatment) with selected applications restricted to Engg.

TEXT BOOKS

1.William W. Hines & Doughlas C. Montgomery (2002), Probability and statistics in Engg and management science, John Wiley & Sons, 4th edition.

REFERENCE BOOKS:

1. Kishor S. Trivedi (2000), Probability and Statistics with Reliability, Queuing and Computer Science Applications, Prentice Hall of India.

2. Sheldon M. Ross (2007), Introduction to Stochastic processes, Academic Press, USA, 9th edition.

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SOFTWARE PROJECT MANAGEMENT

Category:	Interdisciplinary Elective Course
Prerequisite:	Basic Software Engineering.
Learning Objective:	To knowProject Evaluation and Planning. To introduce the concept of Project Sequencing and Scheduling. To know Quality Management and People Management.
Learning Outcome:	Students will able to understand software project model.

UNIT I: Project Evaluation and Planning (10 Hours)

Activities in Software Project Management, Overview Of Project Planning, Stepwise planning, contract management, Software processes and process models. Cost Benefit Analysis, Cash Flow Forecasting, Cost-Benefit Evaluation Techniques, Risk Evaluation. Project costing, COCOMO 2, Staffing pattern, Effect of schedule compression, Putnam's equation, Capers Jones estimating rules of thumb.

UNIT II: Project Sequencing and Scheduling (10 Hours)

Project Sequencing and Scheduling Activities, Scheduling resources, Critical path analysis, Network Planning, Risk Management, Nature and Types of Risks, Managing Risks, Hazard Identification, Hazard Analysis, Risk Planning and Control, PERT and Monte Carlo Simulation techniques.

UNIT III: Monitoring And Control (10 Hours)

Collecting Data, Visualizing Progress, Cost Monitoring, review techniques, project termination review, Earned Value analysis, Change Control, Software Configuration Management (SCM), Managing Contracts, Types of Contracts, Stages in Contract Placement, Typical Terms of a Contract, Contract Management and Acceptance.

UNIT IV: Quality Management and People Management (10Hours)

Introduction, Understanding Behavior, Organizational Behaviour, Selecting The Right Person For The Job, Motivation, The Oldman – Hackman Job Characteristics Model , Working in Groups, Organization and team structures, Decision Making, Leadership, Organizational Structures, Stress, Health And Safety. ISO and CMMI models, Testing, and Software reliability, test automation, Overview of project management tools.

TEXT BOOKS

1. Bob Hughes, Mike Cotterell, "Software Project Management", Fifth Edition, Tata McGraw Hill, 2011.

REFERENCE BOOKS

1. Royce, "Software Project Management", Pearson Education, 1999.

2. Robert K. Wysocki, Effective Software Project Management, Wiley, 2009.

E-COMMERCE

Category:	Interdisciplinary Elective Course
Prerequisite:	Basic Software Engineering.
Learning Objective:	To knowProject Evaluation and Planning. To introduce the concept of Project Sequencing and Scheduling. To know Quality Management and People Management.
Learning Outcome:	Students will able to understand software project model.

UNITI **(12 hours)**

Electronic Commerce: Frame work, anatomy of e-commerce applications, e-commerce consumer applications, e-commerce organization applications, consumer oriented electronic commerce, mercantile process models. Electronic payment systems: Digital token based, smart cards, credit cards, risks in electronic payment systems.

Inter Organizational Commerce: EDI, EDI implementation, value added networks.

UNIT II **(12 hours)**

Intra Organizational Commerce: Work flow, automation customization and internal commerce, supply chain management. Corporate Digital Library: Document library, digital document types, corporate data warehouses, advertising and marketing, information based marketing, advertising on internet, online marketing process, market research.

UNIT III **(8 hours)**

Consumer Search and Resource Discovery: Information search and retrieval, commerce catalogues, information filtering.

UNITIV **(8 hours)**

Multimedia: Key multimedia concepts, digital video and electroniccommerce, desktop video processing, desktop video conferencing.

TEXT BOOKS

1. Ravi Kalakota and Andrew B. Whinston, Frontiers of electronic commerce, Pearson, 1996.

REFERENCE BOOKS

1. Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, Ecommerce fundamentals and applications, John Wiley, 2008.

2.S. Jaiswal, E-Commerce, Galgotia Publications, 2003.

Interdisciplinary Elective-III

DIGITAL IMAGE PROCESSING

Course Type: Interdisciplinary Elective Course

Prerequisite: A fundamental study on matrix convention, probability theory and statistical principles are needed to be learned.

Course Objective: The objective of the course is to understand a digital image and different processing techniques for the better analysis of an image.

Course outcome: The students on completing the course will be able to describe the fundamentals of an image and can implement different algorithms to process the images as per the requirement.

UNIT – I: DIGITAL IMAGE FUNDAMENTALS ANDTRANSFORMS (10 Hours)

Elements of visual perception: Light, Brightness adaption and discrimination,Pixels, coordinate conventions, Imaging Geometry, Image sampling andquantization Basic relationship between pixels: Basic geometrictransformations-Introduction to Fourier Transform and DFT : Properties of 2DFourier Transform , FFT, Separable Image Transforms ,Walsh – Hadamard –Discrete Cosine Transform, Haar, Slant – Karhunen – Loevetransforms.Perspective Projection, Spatial Domain Filtering, sampling andquantization.

UNIT – II: IMAGE ENHANCEMENT TECHNIQUES(10 Hours)

Spatial Domain methods: Basic grey level transformation, Histogramequalization, Image subtraction, Image averaging, Spatial filtering: Smoothing,sharpeningfilters,Laplacian filters, Frequency domain filters: Smoothing,Sharpeningfilters,Homomorphic filtering.

UNIT – III: IMAGE RESTORATIONAND IMAGECOMPRESSION (10Hours)

Model of Image Degradation/restoration process: Noise models, Inversefiltering, Least mean square filtering, Constrained least mean square filtering,Blind image restoration, Pseudo inverse, Singular value decomposition.

Lossless compression: Variable length coding: LZW coding, Bit plane coding, predictive coding, DPCM.Lossy Compression: Transform coding – Wavelet coding – Basics of Imagecompression standards: JPEG, MPEG, Basics of Vector quantization

UNIT – IV: IMAGE SEGMENTATION AND REPRESENTATION(10 Hours)

Edge detection: Thresholding, Region Based segmentation, Boundaryrepresentation: chair codes, Polygonal approximation, Boundary segments:boundary descriptors: Simple descriptors, Fourier descriptors, Regionaldescriptors, Simple descriptors, Texture

TEXT BOOKS:

1. Digital Image Processing, 3rd Edition, by Rafael C Gonzalez and RichardE Woods. Publisher: Pearson Education.

REFERENCE BOOKS:

1. Fundamentals of Digital Image Processing, By Anil K Jain
2. Digital Image Processing, By William K Pratt, John Willey (2001)
3. Image Processing Analysis and Machine Vision, By MillmanSonka, Vaclavhlavac, Roger Boyle, Broos/colic, Thompson Learniy (1999).

4. Digital Image Processing and Applications, By, B. Chanda, D. DuttaMagundar,Prentice Hall of India, 2000

PATTERN RECOGNITION

Category: Interdisciplinary Elective Course

Prerequisite: Basic of Algorithm, Linear Algebra, Vector Space, Probability and Statistics

Learning Objective:
To know about supervised and unsupervised Learning.
To study about feature extraction and structural pattern recognition.
To explore different classification models.
To learn about fuzzy pattern classifiers and perception.

Learning Outcome: On Completion of the course, the students should be able to:
Classify the data and identify the patterns.
Extract feature set and select the features from given data set.

UNIT –I: INTRODUCTION AND STASTICAL PATTERN RECOGNITION(10 Hours)

Introduction and mathematical preliminaries - What is pattern recognition? Clustering vs. Classification; Applications; Linear Algebra, vector spaces, probability theory, estimation techniques.

Classification: Bayes decision rule, Error probability, Error rate, Minimum distance classifier, Mahalanobis distance; K-NN Classifier, Linear discriminant functions and Non-linear decision boundaries.

UNIT –II:(10 Hours)

Fisher's LDA, Single and Multilayer perceptron, training set and test sets, standardization and normalization.Clustering: Different distance functions and similarity measures, Sum of Squared Error Technique, Minimum within cluster distance criterion, K-means clustering, single linkage and complete linkage clustering, , existence of unique clusters or no clusters

UNIT –III: (12 Hours)

Feature selection: Problem statement and Uses, Probabilistic reparability based criterion functions, interclass distance based criterion functions, Branch and bound algorithm, sequential forward/backward selection algorithms, (l,r) algorithm.Feature Extraction: PCA, Kernel PCA.

UNIT –IV: (08 Hours)

Recent advances in PR: Structural PR, SVMs, FCM, Soft-computing and Neuro-fuzzy

TEXT BOOKS:

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, JohnWiley, 2001.
2. 3. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.

REFERENCE BOOKS:

1. Statistical pattern Recognition; K. Fukunaga; Academic Press, 2000.
2. M. Narasimha Murthy and V.Susheela Devi, ―Pattern Recognition‖, Springer 2011.
3. Robert J.Schalkoff, ―Pattern Recognition Statistical, Structural and Neural Approaches‖, John Wiley & Sons Inc., New York, 1992.
4. C.M.Bishop,―Pattern Recognition and Machine Learning‖, Springer, 2006.
5. Andrew Webb, ―Stastical Pattern Recognition‖, Arnold publishers, London, 1999.

WEB REFERENCES

1. http://www.ph.tn.tudelft.nl/PRInfo/
2. http://kdd.ics.uci.edu/
3. http://morden.csee.usf.edu/nnc/index1.html
4. http://www.iapr.org/

WIRELESS SENSOR NETWORK

Category:	Interdisciplinary Elective Course
Prerequisite:	Basic Computer Network
Learning Objective:	The purpose of this course is to introduce students to 1. Obtain a broad understanding about the network architecture of wireless sensor network. 2. Understand all basic characteristics of wireless sensor networks and sensor nodes. 3. The principles of data transmission, clustering algorithm and routing protocols. 4. Design and development of new network architecture and MAC protocols.
Learning Outcome:	This course enables us to understand the concepts of wireless sensor networkand its applications.

UNIT –I:INTRODUCTION (10 Hours)

Networked wireless sensor devices, Applications: Habitat Monitoring, Smart Transportation, Key design challenges. **Network deployment:** Structured versus randomized deployment, Network topology, Connectivity. Introduction to cloud system,Sensor Cloud Systems, Challenges in Sensor Cloud Systems.

UNIT –II: LOCALIZATION AND WIRELESS CHARACTERISTICS (10 Hours)

Localization: issues & approaches, Coarse-grained & Fine-grained node localization, Network-wide localization. Wireless characteristics: Basics, Wireless link quality, Radio energy considerations, SINR capture model for interference.

UNIT –III: MEDIUM-ACCESS AND SLEEP SCHEDULING (10 Hours)

Issues in designing MAC protocol for WSNs, Classification of MAC Protocols, Energy efficiency in MAC protocols, Asynchronous sleep techniques, Sleep-scheduled techniques.

Classification of Energy Management SchemesSleep-based topology control: Constructing topologies for connectivity, constructing topologies for coverage.

UNIT –IV: ROUTING AND INTEGRATION OF SENSOR & CLOUD SYSTEM (10 Hours)

Routing: Metric-based approaches, Routing with diversity, Multi-path routing, Lifetime-maximizing energy-aware routing techniques, Geographic routing. Data-centric routing, Data-gathering with compression, Querying, Data-centric storage and retrieval, The database perspective on sensor networks.

TEXT BOOKS:

1. Wireless Sensor Networks: Technology, Protocols, and Applications: KazemSohraby, Daniel Minoli, TaiebZnati , Wiley Inter Science.
2. Networking Wireless Sensors: BhaskarKrismachari, Cambridge University Press

REFERENCE BOOKS:

1. Wireless Sensor Networks: Architectures and Protocols: Edgar H. Callaway, Jr. Auerbach Publications, CRC Press.
2. Wireless Sensor Networks: Edited by C.S Raghavendra, Krishna M, Sivalingam, TaiebZnati , Springer.
3. Distributed Sensor Networks: A Multiagent Perspective, Victor Lesser, Charles L. Ortiz, and MilindTambe , Kluwer Publications.
4. Wireless Sensor Networks: An Information Processing Approach- by Feng Zhao, Leonidas Guibas , Morgan Kaufmann Series in Networking 2004.

Category: Programme Elective Course
Prerequisite: Knowledge of Computer software.
Learning Objective: To learn EJB application
To learn CORBA and COM
Learning Outcome: Students will get knowledge in middleware technologies

UNIT-I: (10 hours)
Client / Server concepts: client-server, file server, database server, group server, object server, web server, middleware, general middleware, service specific middleware, client / server building blocks, RPC, messaging, peerto- peer.
UNIT-II: (10 hours)
EJB Architecture: EJB, EJB architecture, overview of EJB software architecture, view of EJB, conversation, building and deploying EJBs, rolesin EJB.
UNIT-III: (08 hours)
EJB Applications: EJB APPLICATIONS: EJB session beans, EJB entity beans, EJB clients, EJB deployment, building an application with EJB
UNIT-IV: (12 hours)
CORBA: CORBA, distributed systems, purpose, exploring CORBA alternatives, architecture overview, CORBA and networking model, CORBA object model, IDL, ORB, building an application with CORBA
COM:COM, data types, interfaces, proxy and stub, marshalling, implementing server/client, interface pointers, object creation, invocation, destruction, comparison COM and CORBA .Introduction to .NET, overview of .NET architecture, marshalling, remoting.

TEXT BOOK
1. Robert Orfali, Dan Harkey and Jeri Edwards, The Essential Client /
Server Survival Guide, Galgotia Publications, 2002.
2. Tom Valesky, Enterprise Java Beans, Pearson Education, 2002.
REFERENCE BOOKS
1. Mowbray, Inside CORBA, Pearson Education, 2002.
2. Jeremy Rosenberger, Teach Yourself CORBA in 14 days, TEC Media, 2000.
3. Jason Pritchard, COM and CORBA Side by Side, Addison Wesley, 2000.
4. Jesse Liberty, Programming C#, 2/e, O'Reilly Press, 2002.

COMPUTER ORIENTED NUMERICAL METHODS

Category: Interdisciplinary Elective Course
Prerequisite: Basic Mathematics.
Learning Objective: 1.To Understand integration & differentiation
2. Understand the differential equation and root finding.
3. Understand thesolution of system of linear equation.
Learning Outcome: The purpose of this course is to impart knowledge on computer oriented numerical methods

UNIT-I: ERROR (10 Hours)
Calculation and handling of error in programming. Interpolation: Newton's. Lagrange's, Gauss. Stirling's and Bessel's interpolation formulae and their accuracy, Inverse interpolation.Interpolation with two independent variables (elementary idea only).

UNIT-II: INTEGRATION & DIFFERENTIATION (08 Hours)

Trapezoidal, Simpson, Weddle's and Gaussian Quadrature methods and their accuracy. Numerical derivative (1st and 2nd order) based on Newton's Forward and Stirling's interpolation.

UNIT-III: DIFFERENTIAL EQUATION ANDROOT FINDING (12 Hours)

Euler's method, Runge-Kutta Method (4th order algorithm), Finite difference method, J.C. Adam and Successive approximation method. Bisection, False Position, Newton-Raphson and Iteration Method. Simultaneous Equation for Several unknown: Newton-Raphson and Iteration Method.Solution for Multiple roots: Graeffe's Root Squaring method.

Least square fitting of a set of points: Line. Quadratic and Cubic Interpolation: Linear, Quadratic and Cubic Spline methods.

UNIT-IV: SOLUTION OF SYSTEM OF LINEAR EQUATION (10 Hours)

Matrix inversion method, Gaussian elimination method, LU decomposition method, Pivoting. Eigen value and Eigenvector of Symmetric Matrix: Jacobi Transformations, Gaussianelimination method.

TEXT BOOKS:

1. J.B. Scarborough: Numerical Mathematical Analysis (Oxford and IBH)

REFERENCES:

1. E. Balgurusamy: Numerical Methods (TMH)
2. V. Rajaraman: Computer Oriented Numerical Methods
3. George W. Collins, II: Fundamental Numerical Methods and Data Analysis - Free
4. Internet resource available at httP.7/ads.harvard.edu/books/1990fnmd.book

ENTREPRENUERIAL MANAGEMENT

Category:	Interdisciplinary Elective Course
Prerequisite:	Basic knowledge about management and business strategies.
Learning Objective:	This is a program geared toward entrepreneurial-minded individuals. It focuses on business and management topics to help students build future enterprises.
Learning Outcome:	The students will inculcate an advance level of entrepreneurship and its importance in business and society development.

UNIT – I: (10 Hours)

Entrepreneur: Definition, Evolution of entrepreneurship, characteristics of entrepreneur, entrepreneurial mindset, theories of entrepreneurship, motivation for entrepreneurship, role of entrepreneurship in economic development, entrepreneurship development programmes, corporate entrepreneurship, meaning and benefits of corporate entrepreneurship.Growth of small scale industries in developing countries and their positions vis-à-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control type. Government policy for small scale industry; stages in starting a small scale industry

UNIT – II: (10 Hours)

Sources Of Innovative Ideas**:** Methods of generating ideas, opportunity, identification, setting-up new ventures, acquiring existing business, franchising, business model, components of business model, types of business model.Project identification: Assessment of viability, formulation, Evaluation, financing, field-study and collection of information, preparation of project report,

demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT – III: (10 Hours)

Business Plan:Contents of business plan, the marketing plan, the Organisational plan, the financial plan, sources of finance, institutional support to entrepreneurs, management of business, financial management, human resource management, marketing management, production and operation management.

UNIT – IV: (10Hours)

Social Entrepreneurship**:** Introduction, definition, importance, characteristics of social enterprise, funding of social enterprise, significance of social entrepreneurs, measures of success in a socialenterprise, live examples of social entrepreneurs.Laws concerning entrepreneur: Partnership laws, business ownership, sales and incometaxes and workman compensation act. Role of various national and state agencies whichrender assistance to small scale industries.

TEXT BOOK

1. Rodert D. Hisrich, M.J. Manimala, M.P. Peters, D.A. Shepherd, Entrepreneurship,McGraw Hill, 2014.
2. Rajeev Roy, Entrepreneurship, 3/e, Oxford University Press, 2012.

REFERENCE BOOK

1. Donald F. Kuratko, Entrepreneurship: Theory, Process, Practice, 9/e, CengageLearning, 2012.
2. Poornima M. Charantimath, Entrepreneurship Development - Small BusinessEnterprises, Pearson Education, 2012.
3. Arya Kumar, Entrepreneurship: Creating and Leading an EntrepreneurialOrganization, Pearson Education, 2012.

REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS

Category:	Interdisciplinary Elective Course
Prerequisite:	Basic knowledge geography and computer science.
Learning Objective:	To Understand Geographic information system Understand remote sensing. Understand natural resources management
Learning Outcome:	The purpose of this course is to impart knowledge on remote sensing and geographic information systems

UNIT I **(10 hours)**

Fundamentals of Remote Sensing: Introduction, electromagnetic radiation, electromagnetic spectrum, energy interactions with earth's surface materials and atmosphere, sensors and platforms, false colour composite (FCC) image, image interpretation techniques, satellite remote sensing - Indian context.

UNIT II **(12 hours)**

Fundamentals of GIS: Introduction, elements of GIS, vectorization, rasterization, geo-referencing, map projections, digitization process, data base handling, types of data structures, overlay analysis, surface terrain models - digital elevation model (DEM), triangulated irregular network (TIN), and slope models.RS and GIS Techniques for Natural Resources Management: Land use/ land cover classification systems, forest cover, agriculture and wasteland management. water resources management.

UNIT III **(08 hours)**

RS and GIS Techniques for Infrastructure Planning and Management: Urban utilities, cadastral mapping and transport network. GPS Navigationsystem for various applications.

UNIT III **(10 hours)**

RS and GIS Techniques for Natural Disasters Management: Earthquakes, landslides, cyclones and floods - hazard zonation, riskassessment, relief and rehabilitation measures.

TEXT BOOKS

1. P.K. Guha, Remote Sensing for the Beginner, EWP Ltd., 2013.
2. M. Anjireddy, Text Book of Remote Sensing and Geographical Information Systems, BSP Publishers, 2012.

REFERENCE BOOK

1. T.M. Lillesand and Kiefer, Remote Sensing and Image Interpretation, R.W. John Wiley & Sons Publishers, 2008.

BUSINESS ETHICS AND CORPORATE GOVERNANCE

Category:	Interdisciplinary Elective Course
Prerequisite:	Basic knowledge geography and computer science.
Learning Objective:	To Understand Corporate Governance. Understand Pillars of Governance in Organizations. Understand Business Ethics and CSR
Learning Outcome:	The purpose of this course is to impart knowledge on business ethics and corporate governance

UNIT I **(08 Hours)**

Introduction: Corporation, definition and characteristics, history of corporateform and models, corporate objectives, corporations and government,governance, corporate governance, definition, perspectives.

UNIT II **(12 Hours)**

Theoretical Foundations of Corporate Governance: Notion of conflictof interest, property rights theory, nexus of contracts, agency theory, Berleand Means' theory, concept of separation of ownership and control, shareholder,stakeholder debate.Pillars of Governance in Organizations: Owners, ownership structure,types of owners, ownership vs. control, board of directors, types of directors,board roles and board attributes, board committees, executive management,role of CEO, succession planning, managerial myopia, institutionalinvestors, types, categories, features and role.

UNIT III **(12 Hours)**

Work Ethos: Values and ethics, model of management in the Indian socio,political environment, need for values in global change, Indian perspective,values for managers, holistic approach for managers in decision making.

UNIT II **(12 Hours)**

Business Ethics and CSR: Corporation as a social institution, accountabilityand sustainability, relevance of triple bottom line reporting to CSR,codes of conduct, applications of ethical theories to decision making, ethical
issues related to employment, healthcare and advertisement.

TEXT BOOKS

1. Praveen B. Malla, Corporate Governance: Concept, Evolution and India Story, Routledge, 2010.
2. Sadri, Business Ethics: Concepts and Cases, Tata McGraw Hill, 1998.

REFERENCE BOOKS

1. Robert Monks, Nell Minow, Corporate Governance, Wiley Publications, 2009.

Programme Elective-I

ADVANCED COMPUTER ARCHITECTURE

Category: Program Elective Course
Prerequisites: Compute Architecture and Organisation
Learning Objective: To identify the key components of a computing system
To model the parallel programming paradigm
Learning Outcomes: Ability to evaluate the performance of new computing systems
Ability to interface and integrate new equipments to the existing protocols and standards

UNIT I: INTRODUCTION TO PARALLEL PROCESSING (10 hours)
Trends towards parallel processing, parallel processing mechanisms. Multicomputer and multiprocessor system, Flynn's classification.Parallel Computer Structures: Pipeline computers, Shared Memory Architecture:UMA, NUMA, loosely coupled multiprocessors, tightly coupled multiprocessors, PRAM model.

UNIT II:PIPELINING AND SUPERSCALAR TECHNIQUE (10 hours)
Pipelining: Basic Concepts of pipelining, data hazards, control hazards and structural hazards.Techniques for overcoming or reducing the effects of various hazards, Speedup, efficiency, throughput.Scheduling- Static scheduling-loop unrolling, Dynamic Scheduling-Scoreboard and Tomasulo's Approach

UNIT III:INSTRUCTION-LEVEL PARALLELISM (10 hours) Concepts of instruction-level parallelism (ILP), techniques for increasing ILP, superscalar, super-pipelined and VLIW processor architectures, array processor, vector processor, symbolic processors, Associative Processor, Systolic architecture. Amdahl's Law, Scalability-Isoefficiency function, Rule of Thumb.

UNIT IV: INTERCONNECTION NETWORKS AND CACHE ORGINISATION (10 hours)
Definition of Network Topologies, Classification - Static Networks, , Dynamic Networks. Bus, Mesh, Shuffle-Exchange, Omega, Cube, Hypercube.Factors affecting performance of interconnection network. Cache memory organization- Principle of locality, cache mapping, types of cache miss. Techniques to reduce cache misses. multilevel cache, cache coherence and synchronization mechanism. Cache write policy.

TEXT BOOKS:
1. Kai Hwang and Faye A. Briggs, Computer Architecture and Parallel Processing, 1990.
2. John L. Hennessey and David A. Patterson, Computer Architecture: A Quantitative Approach, 3/e, Morgan Kaufmann, 2003.

REFERENCE BOOKS
1. David A. Patterson and John L. Hennessy, Computer Organization and Design, Elsevier.
2. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw-Hill.
3. Computer Architecture: Parhami, Oxford University Press

INFORMATION RETRIEVAL SYSTEM

Category: Programme Elective Course
Prerequisite: Data Structure and Algorithm, Linear Algebra, Basics of Web programming

Learning Objective: This course will cover traditional material, as well as recent advances in Information Retrieval (IR), the study of indexing, processing, and querying textual data. Basic retrieval models, algorithms, and IR system implementations will be covered. It will also cover web search, link analysis.

Learning Outcome: Student will learn how to analyze texts and knowledge discovery techniques both online and offline.

UNIT –I: INTRODUCTION (10 Hours)

Introduction to course: Discussion of issues in search, Introduction to Information Retrieval. Inverted indices and Boolean queries. Query optimization. The nature of unstructured and semi-structured text. Course administrative. The term vocabulary and postings lists. Text encoding: tokenization, stemming, lemmatization, stop words, phrases. Optimizing indices with skip lists. Proximity and phrase queries. Positional indices.

UNIT –II: INDEX CONSTRUCTION AND SCORING (10 Hours)

Index construction. Postings size estimation, sort-based indexing, dynamic indexing, positional indexes, n-gram indexes, distributed indexing, real-world issues.Index compression: lexicon compression and postings lists compression. Gap encoding, gamma codes, Zipf's Law, variable-byte encoding. Blocking. Extreme compression.Dictionaries and tolerant retrieval. Dictionary data structures. Wild-card queries, permuterm indices, n-gram indices. Spelling correction and synonyms: edit distance, soundex, language detection.Scoring, term weighting, and the vector space model. Parametric or fielded search. Document zones. The vector space retrieval model. TF/IDF weighting. The cosine measure. Scoring documents.

UNIT –III: COMPUTING SCORES AND RESULTS SUMMARIES (10 Hours)

Computing scores in a complete search system: Components of an IR system. Efficient vector space scoring. Nearest neighbour techniques, reduced dimensionality approximations, random projection.

Results summaries: static and dynamic. Evaluating search engines. User happiness, precision, recall, F-measure. Creating test collections: kappa measure, inter judge agreement. Relevance, approximate vector retrieval Probabilistic IR. Binary Independence Model.

UNIT –IV: CLASSIFICATION AND LEARNING &WEB SEARCH AND LINK ANALYSIS (10 Hours)

CLASSIFICATION : Introduction to text classification. Naive Bayes models. Spam filtering. Probabilistic IR. K Nearest Neighbors, Decision boundaries, Vector space classification using centroids. Support vector machine classifiers. Kernel Function. Evaluation of classification. Micro- and macro-averaging. Learning rankings.

CLUSTERING: Introduction to the problem. Partitioning methods: k-means clustering; Hierarchical clustering. Learning to rank. Latent semantic indexing (LSI). Applications to clustering and to information retrieval. Web search overview, web structure, the user, paid placement, search engine optimization/spam. Web size measurement.Link analysis, Crawling and web indexes. Near-duplicate detection.

TEXT BOOKS:

1. Introduction to Information Retrieval, Christopher D. Manning, PrabhakarRaghavan, HinrichSchütze, Cambridge University Press.

REFERENCE BOOKS:

1. Readings in Information Retrieval, K.Sparck Jones and P. Willet, Morgan Kaufmann.
2. Modern Information Retrieval, Ricardo BaezaYates and BerthierRibeiroNeto, Ricardo Baeza-Yates and BerthierRibeiro-Neto Addison-Wesley.

SEMANTIC WEB

Category: Program Elective Course
Prerequisites: Basic Computer science
Learning Objective: To identify Web Intelligence
To knowKnowledge Representation for the Semantic Web.
Understanding Semantic Web Applications, Services and Technology
Learning Outcomes: This course enables students to understand semantic web.

UNIT I **(12 hours)**

Web Intelligence: Thinking and intelligent web applications, theinformation age ,the world wide 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 the semantic web. Knowledge Representation for the Semantic Web: Ontologies and their role in the semantic web, ontologies languages for the semantic web - Resource Description Framework(RDF) / RDF schema, Ontology Web Language(OWL),UML,XML/XML schema.

UNIT II **(08 hours)**

Ontology Engineering: Ontology engineering, constructing ontology, ontology development tools, ontology methods, ontology sharing and merging, ontology libraries and ontology mapping, logic, rule and inference engines.

UNIT III **(10 hours)**

Semantic Web Applications, Services and Technology: Semantic web applications and services, semantic search, e-learning, semantic bioinformatics, knowledge base, XML based web services, creating an OWL-S ontology for web services, semantic search technology, web search agents and semantic methods.

UNIT IV **(10 hours)**

Social Network Analysis and semantic web: What is social networksanalysis? Development of the social networks analysis, electronic sources for network analysis, electronic discussion networks, blogs and online communities, web based networks, building semantic web applications with social network features.

TEXT BOOK(S)

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

REFERENCE BOOK

1. Davies, R.Studer, P.Warren, Semantic Web Technologies, Trends and Research in Ontology Based Systems, J John Wiley and Sons, 2007.
2. Liyang Lu Chapman and Hall, Semantic Web and Semantic Web Services,CRCPublishers, 2007.
3. Heiner Stuckenschmidt, Frank Van Harmelen, Information Sharing on thesemantic Web, Springer Publications, 2004.
4. T.Segaran, C.Evans, J.Taylor, Programming the Semantic Web, O'Reilly, 2009.

CLOUD COMPUTING

Category: Programme Elective Course
Prerequisite: Basic Computer Network
Learning Objective: 1. To develop the understanding of fundamentals and technological aspects of Cloud

Computing.
2. Management of cloud services.
3. Virtualization along with various terminologies and the keywords used in Cloud Computing and virtualization
4. Storage network design and optimization

Learning Outcome: This course enables us to understand the concepts of Cloud Computing and its applications.

UNIT –I:CLOUD COMPUTING FUNDAMENTALS(10 Hours)

Introduction; Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas.Cloud Computing definition, private,public and hybrid cloud. Cloud types; IaaS,PaaS, SaaS. Benefits and challenges of cloud computing, public vs privateclouds, role of virtualization in enabling the cloud; Business Agility: Benefits andChallenges to Cloud architecture. Application availability, performance, securityand disaster recovery

UNIT –II: MANAGEMENT OF CLOUD SERVICES (08 Hours)

Reliability, availability and security of services deployed from the cloud.Performance and scalability of services, tools and technologies used to managecloud services deployment; Cloud Economics: Cloud Computing infrastructuresavailable for implementing cloud based services.

UNIT –III: VIRTUALIZED DATA CENTER ARCHITECTURE & INFORMATION STORAGE SECURITY & DESIGN(12 Hours)

Cloud infrastructures; public, private, hybrid. Service provider interfaces; Saas,Paas, Iaas. VDC environments; concept, planning and design, business continuityand disaster recovery principles. Managing VDC and cloud environments andinfrastructures.Storage strategy and governance; security and regulations. Designing securesolutions; the considerations and implementations involved. Securing storage invirtualized and cloud environments.

UNIT –IV: STORAGE NETWORK DESIGN & OPTIMIZATION OF CLOUD STORAGE (10 Hours)

Architecture of storage, analysis and planning. Storage network designconsiderations; NAS and FC SANs, hybrid storage networking technologies(iSCSI, FCIP, FCoE), design for storage virtualization in cloud computing, hostsystem design considerations.Global storage management locations, scalability, operational efficiency. Globalstorage distribution; terabytes to petabytes and greater

TEXT BOOKS:

1. Greg Schulz, “Cloud and Virtual Data Storage Networking”, AuerbachPublications [ISBN: 978-1439851739], 2011.
2 GautamShroff, “Enterprise Cloud Computing Technology ArchitectureApplications”, Cambridge University Press; 1 edition, [ISBN: 978-0521137355], 2010.

REFERENCE BOOKS:

1. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A PracticalApproach” McGraw-Hill Osborne Media; 1 edition [ISBN: 0071626948], 2009.
2 Dimitris N. Chorafas, “Cloud Computing Strategies” CRC Press; 1 edition[ISBN: 1439834539],2010.
3 EMC, “Information Storage and Management” Wiley; 2 edition [ISBN: 9780470294215],2012.

HUMAN COMPUTER INTERACTION

Category: Programme Elective Course

Prerequisite: Basics of Computer, Programming, WEB

Learning Objective:
1. Software process and Design rules

2. Implementation and user support
3. Different models for cognition and collaboration
4. Introduction to Ubiquitous computing

Learning Outcome: This course provides a thorough understanding of the user interaction with computers

UNIT –I: INTRODUCTION / FOUNDATION (8 Hours)

The Human – Input-output channels – Human Memory – Thinking – emotions – Psychology & design of interactive systems; Computer – Text entry devices- Positioning, Pointing & drawing – Display devices for Virtual reality, 3D; Interaction – models – Frameworks & HCI, Ergonomics – Interaction styles – WIMP Interfaces – context; paradigms for Interaction, Paradigms, Usability of Interactive Systems, Guidelines, Principles, and Theories

UNIT –II: SOFTWARE PROCESS & DESIGN RULES, IMPLEMENTATION & USER SUPPORT(12 Hours)

Interaction design basics – user focus – scenarios – navigation – screen design & layout; HCI in software process – life cycle – Usability engineering – Interactive design & prototyping ; Design rules – Principles for usability – standards – guidelines – golden rules – HCI patterns

Implementation support – Windowing system elements – using tool kits – user interface management ; Evaluation techniques – goals – expert analysis – choosing a method; universal design principles – multimodal interaction; user support – requirements – Approaches – adaptive help systems – designing user support systems.

UNIT –III: COGNITIVE, COMMUNICATION & COLLABORATIVE MODELS(10 Hours)

Cognitive models – Goal & task hierarchies – Linguistic models – Physical & device models – architectures ; communication & collaboration models – Face-to-face communication – conversation – text based – group working; Task analysis – difference between other techniques – task decomposition – Knowledge based analysis – ER based techniques –uses

UNIT –IV: UBIQUITOUS COMPUTING, HYPERTEXT, WWW(10 Hours)

Ubiquitous computing application research – virtual & augmented reality – information & data visualization ; understanding hypertext – finding things – Web Technology & issues – Static Web content – Dynamic Web content; Groupware systems – Computer mediated communication – DSS – Frameworks for groupware.

TEXT BOOKS:

1. Human Computer Interaction by Alan Dix, Janet Finlay , ISBN :9788131717035, Pearson Education (2004)
2. Designing the User Interface - Strategies for Effective Human Computer Interaction", by Ben ShneidermanISBN : 9788131732557, Pearson Education (2010).

REFERENCE BOOKS:

1. Usability Engineering: Scenario-Based Development of Human-Computer Interaction , by Rosson, M. and Carroll, J. (2002)
2. The Essentials of Interaction Design, by Cooper, et al. , Wiley Publishing(2007)
3. Usability Engineering, by Nielsen, J. Morgan Kaufmann, San Francisco, 1993. ISBN 0-12-518406-9
4. The Resonant Interface: HCI Foundations for Interaction Design , by Heim, S. , Addison-Wesley. (2007)
5. Usability engineering: scenario-based development of human-computer interaction, By Rosson, M.B & Carroll, J.M. , Morgan Kaufman.(2002)
6. Human Computer Interaction in the New Millenium, John M.Carrol, Pearson Education, 2002

WEB REFERENCES

1. www.scis.nova.edu/nova/hci/notes.html

2. http://courses.iicm.tugraz.at/hci/hci.pdf
3. www.ida.liu.se/~miker/hci/course.html

Programme Elective-II

ADVANCED DATA STRUCTURE

Category: Programme Core Course

Prerequisite: Data Structure Basic

Learning Objective:

1. Design and analyze programming problem statements.
2. Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.
3. Understand the necessary mathematical abstraction to solve problems.
4. Come up with analysis of efficiency and proofs of correctness
5. Comprehend and select algorithm design approaches in a problem specific manner.

Learning Outcome: This course enables us to understand the concepts of Data structure & Algorithm and its applications

UNIT –I: INTRODUCTION (10 Hours)

Review of Data Prilinary Structures: Stack, Queue, Linked lists, binary tree and graph.

Time complexity, Asymtotic analysis: complexity-notations, Omega notation and Theta notation, Big O notation, Divide and conquer: Binary search, Quick sort, Merge sort. Master method for recurrence relation, Hashing, B and B + tree, AVL tree,

UNIT –II: GREEDY METHOD AND DYNAMIC PROGRAMMING(10 Hours)

Greedy method: Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest path problem,

Dynamic Programming: General method, applications-Strassen's Matrix chain multiplication, sum of subsets problem.

UNIT –III: BRANCH & BOUND AND ONLINE ALGORITHM(10 Hours)

Branch and Bound: General method (Backtracking), N-queen problem, graph coloring, travelling salesman problem.Online Algorithm: Competitive Analysis, Deterministic Algorithms, Randomized Algorithms, Optimum Offline Algorithms, Case Studies – Ski Rental Problem, List Update Problem.

UNIT –IV: APPROXIMATION ALGORITHM AND NP CLASS PROBLEM (10 Hours)

Approximation Algorithms: Basic Concepts, Bounds, Polynomial Time Approximation Schemes ,Bin Packing Problem. NP-Hard and NP-Complete classes, Cook's theorem. Introduction to Beyond NP-Class

TEXT BOOKS:

1 IntroductiontoAlgorithms,2nd Edition,T.H.Cormen,C.E.Leiserson,R.L.Rivest,andC.Stein,PHIPvt.Ltd.Pearson Education.

REFERENCE BOOKS:

1 Design and Analysis of algorithms, Aho,UllmanandHopcroft, Pearson Education.
2 Computer Algorithms, E.Horowitz, S.Sahani and S.Rajasekharan, Galgotia Publishers pvt.Limited.
3 Algorithms, Robert Sedgewick, Addison- Wesley
4 Data structure using Java, Sahani
5 Online Computation and Competitive Analysis - A. Borodin and R. El-Yaniv, Cambridge Univ. Press,1998.
6 Approximation Algorithms - Vijay V. Vazirani, Springer Verlag, 2003.

DISTRIBUTED SYSTEMS

Category:	Programme Core Course
Prerequisite:	Basic operating system
Learning Objective:	The main objective of studying this course is to understand concept distributed systems; clock synchronization issues, mutual exclusion, deadlock, resource management, system failure and fault tolerance, system protection model in distributed system.
Learning Outcome:	This course enables us to understand the concepts of distributed system.

UNIT – I: INTRODUCTION, THEORITICAL FOUNDATION (10 Hours)

Overview:Concepts, architecture, issues in distributed OS, communication model: message passing, RPC, Theoretical Foundations: Physical clocks, Logical clock, vector clock, happened before relation, major property of the clocks. Applications of clock synchronization: causal ordering of messages (Birman-Schiper-Stephenson, and Schiper-Eggli-Sandoz protocols) Global state: consistent global state, (chandy-lamport's global state recording algorithm), Cuts in distributed computation, Huang's termination detection algorithm.

UNIT – II: MUTUAL EXCLUSION, DEAD LOCK, AND AGREEMENT PROTOCOLS (10 Hours)

Distributed Mutual Exclusion: What is it? Mutual Exclusion in uniprocess system/shared memory systemvs Distributed systems.System Model, requirements, performance metrics. Algorithms: Lamport's algorithm,Ricart-Agrawala algorithm,Maekawa's Quorum based algorithm, Suzuki-Kasami Broadcast Algorithm,Raymond's Tree-Based Algorithm, Singhal's heuristic algorithm.

Distributed Deadlock Detection: Preliminaries, handling strategies, control organizations, Algorithms : Centralized control (Completely centralized control, Ho-Ramamurthy algorithms), Distributed deadlock detection (Path pushing, Edge-chasing algorithms, diffusion computation based algorithms), Hierarchal deadlock detection (Ho-Ramamurthy algorithms).

Agreement Protocols : Introduction, System model, classifications (Byzantine, consensus, and interactive agreement protocols), Lamport's algorithm, Dolev et alia Algorithm. Applications of agreement protocols.

UNIT – III: DISTRIBUTED RESOURCE MANAGEMENT (10 Hours)

Distributed File Systems: Architecture, Mechanism for building Distributes file system, Design issues, Case studies (SUN NFS, SPRITE).

Distributed Shared Memory: Architecture, advantages, Algorithms : Central server approach, Migration algorithm, Read replication algorithm, Full replication algorithms, Memory coherence (Introduction only).Distributed Scheduling: Introduction, motivation, Issues in load distribution, components of load distribution, Load distributing algorithms (Sender-initiated, Receiver-initiated algorithm), Task Migration, issues in task migration

UNIT – IV: FAILURE RECOVERY, FAULT TOLERENCE, AND RESOURCE SECURITY AND PROTECTION (10 Hours)

Failure Recovery: Types of failure, Backward and forward error recovery, Recovery in concurrent systems (Orphan message and the Domino effect, Lost messages, Livelocks). Checkpoints : consistent, and strongly consistent state of checkpoints. Fault Tolerance : Introduction, issues, two-phase commit protocols, non-blocking commit protocols, Voting

protocols.Access and Flow Control: Introduction, The access matrix model, Safety in the access matrix model, Lattice model and information flow.

TEXT BOOKS:

1. Singhal, Mukesh& N.G. Shivaratri, Advanced Concepts in Operating Systems, TMH.

REFERENCE BOOKS:

1 P. K. Sinha, "Distributed Operating Systems" PHI, 1998.
2 A.S. Tanenbaum, Modern Operating Systems, PHI
3 G. Coluris, Distributed Systems-Concepts and Design.
4 Chow, Johnson, Distributed Operating Systems, Addison-Wesley

NEURAL NETWORKS

Category: Programme Core Course
Prerequisite: Data Artificial intelligence
Learning Objective:
1. Understanding learning process.
2. Understanding Single layer and multilayer perception.
3. Understand the necessary Redial Basis Function Networks.

Learning Outcome: This course enables us to understand the concepts of neural network

UNIT – I (10 Hours)

Introduction : History of neural networks, structure and function of a biological neuron, models of a neuron, neural networks viewed as secreted graphs, feed back network architectures.

Learning process : Error correction learning, memory – based learning, Hebbian learning, competitive learning, Boltzmann learning.

UNIT – II (10 Hours)

Single layer and multilayer perception : Adaptive filtering problem, learning curves, perception convergence theorem, multi layer perception, back propagation, output representation and decision rules, network pruning techniques.

UNIT – III (08 Hours)

Hopfield Networks : The Hopfield model, Hopfield networks , recurrent and Bidirectional associative memories, counter propagation networks, artificial Resonance theory.

UNIT – IV (12 Hours)

Redial Basis Function Networks : Introduction , cover‟s Theorem on the Separability of Patterns, Interpolation problem, Supervised learning as an III – Posed Hyper surface Reconstruction problem, Regularization theory, Regularization Networks, Generalized Radial Basis Function Networks, XOR Problem (revised) Estimation of the regularization parameter, Approximation properties of RBF Networks.

TEXT BOOKS:

1. Introduction to Aritifical Neural System, S.M.Zurada, Jaico Publishing House (1992)
2. Neural networks – A Comprehensive Foundation by Simon Haykin – Second Edition – Pearson Education.
3. Neural Computing – Theory and Practice, Philip D. Wesserman, Van Nostrand Rein hold, New York (1989)
4. Neural Networks and Fuzzy Systems, Bart Kosko, Prentice Hall, NJ (1992)

REFERENCE BOOKS:

1. Artificial Neural Networks by B. Yegnanarayana – PHI publications

REAL TIME SYSTEMS

Category: Programme Elective Course

Prerequisite: Data Structure and Algorithm, Linear Algebra, Basics of Web programming

Learning Objective:

3. Basics of Real time systems
4. Real time memory and design considerations
5. Integration of Hardware and software in real time applications

Learning Outcome: This course enables us to understand the concepts of Real time systems and its applications

UNIT –I:INTRODUCTION(8 Hours)

Basic real time concepts - Introduction, Real-time Versus Conventional Software, Computer Hardware for Monitoring and Control, Software Engineering Issues.

UNIT –II: DESIGN TECHNIQUES AND MEMORY MANAGEMENT (10 Hours)

Real time specification and design techniques – structure of an RTOS - real time kernels – inter task communication and synchronization.Real time memory management. System performance analysis and optimization.

UNIT –III: QUEUING MODELS AND FAULT TOLERANT ARCHITECTURES(9 Hours)

Queuing models – Reliability,testing and fault tolerance, HW/SW faults, diagnosis, functional testing . Faulttolerant architectures: TMR systems - multiprocessing systems.

UNIT –IV: REAL-TIME DATABASES AND COMMUNICATION, APPLICATIONS (13 Hours)

Introduction – Main Memory Databases – Transaction Priorities – Concurrency Control Issues – Disk Scheduling Algorithms – Databases for Hard Real-Time Systems – Fault-Tolerant Routing Hardware/Software integration, real time applications- case studies

TEXT BOOKS:

1 LaplantePhilip.A, "Real-time systems design and analysis: An engineer's handbook",2nd Edition, PHI.,1994.

2 C.M.Krishna, Kang G.Shin, "Real-time systems" – McGraw Hill, 1997.

REFERENCE BOOKS:

1 Alan C. Shaw , "Real – Time Systems and software ",John Wiley & Sons Inc,2001

2 Buhr R J and Bailey D L, "An Introduction to Real-Time Systems", Prentice-Hall 1999.

3 Burns, A and Wellings, A, "Real Time Systems and Programming Languages: Ada 95, Real-Time Java and Real-Time C/POSIX", Addison-Wesley. ISBN.,2001

4 Levi S.T. and Agarwal A.K., "Real time System Design", McGraw Hill International Edition, 1990.

5 Rajibmall "Realtime systems, Theory & Practice " , Pearson Education 2007.

WEB REFERENCES

1 www.eventhelix.com/realtimemantra/basics
2. www.unix.ecs.umass.edu/~krishna
3. http://infoweb.vub.ac.be/infoef/ulbarch/
4. www.augustana.ab.ca/~mohrj/courses/2005.winter/cs380/slides.7e

COMPUTER GRAPHICS

Category: Programme Elective Course

Prerequisites: Knowledge on C programming and mathematics

Learning Objectives: To identify and understand the core concepts of computer graphics

- To apply graphics programming techniques to design and create computer graphics scenes.
- To learn about the 2D and 3D transformations including translation,scaling,rotation and reflection .
- To understand principle of clipping,basic line-clipping algorithms
- To learn about application of curves in computer graphics

Learning Outcomes: After successful completion of the course the students will demonstrate their ability to use modern 2D and 3D graphics techniques,models and algorithms to solve graphics problems.

UNIT – I: INTRODUCTION, LINE AND CIRCLE DRAWING ALGORITHMS (10 Hours)

Graphics Hardware: Display devices, input devices, Raster Graphics. Line and Circle drawing algorithms: DDA, Bresenham's line drawing algorithm, midpoint circledrawing algorithm.

UNIT – II:WINDOWING, CLIPPING AND GEOMETRICAL TRANSFORMATION (10Hours)

Windowing and Clipping: Viewing and Window coordinate System, Viewport, Window, Zoom-inZoom-out, Cohen Sutherland, Cyrus beck line clipping algorithms

2D and 3D Geometrical Transformations: Homogeneous Coordinate system, Basic transformations: Translation, Scaling, Rotation and Reflection.

UNIT – III: TRANSFORMATION AND PERSPECTIVE PROJECTIONS (10 Hours)

Viewing Transformation: Parallel Projection: Orthographic, Axonometric, Cavalier and Cabinet. Perspective Projection: one point, two point, three point perspective projection, vanishing point.

UNIT – IV:CURVE, SURFACES, HIDDEN LINE REMOVAL, FACE DETECTION (10 Hours)

Curve and Surfaces: Properties of curves, Blending functions: Cubic Bezier and B-Spline curves. Parametric Surfaces: Surface of revolution Sweep surfaces, Fractal curves and surfaces,

Hidden line/surface removal: Object space and Image space methods, Inside- outside test, Back Face detection: Z-buffer, A-Buffer Methods.Introduction to computer animation.

TOTAL: 48 Hours

TEXT BOOKS

1. Hearn D. and P. Baker, Computer Graphics C version, Prentice-Hall. (Major Reading)

REFERENCE BOOKS:

2. David F. Rozers, Procedural Elements for Computer Grapihics, TMH.
3. David F. Rozers, Mathematical Elements for Computer graphics, TMH.
4. Foley, J.D. A. Van Dam, Computer Graphics: Principles and Practice, Addison- Wesley.

Programme Elective-III

HIGH PERFORMANCE COMPUTING

Category: Programme elective course
Prerequisites: Computer Architecture, Advanced Computer Architeture, OS
Learning Objective: The course highlights different features of High-Performance Computing, and how they can be implemented through the hardware (architectural features) and system software (operating systems, run-time systems).
Learning Outcome: Understand the architecture of modern CPU's and how this architecture influences the way programs should be written.

UNIT-I: Basics of High Performance Computing (10 hours)
RISC processors, Characteristics of RISC processors, RISC vs. CISC, Classification of instruction set architectures, Review of performance measurements, Basic parallel processing techniques: instruction level, thread level and process level.Need of high speed computing – increase the speed of computers – history of parallel computers and recent parallel computers; solving problems in parallel – temporal parallelism – data parallelism – comparison of temporal and data parallel processing – data parallel processing with specialized processors – inter-task dependency. The need for parallel computers - models of computation - analyzing algorithms – expressing algorithms.

UNIT-II: Pipelining Concepts (10 hours)
Principles of pipelining and vector processing - Linear pipelining - Classification of pipeline processors - General pipelines - Instruction and Arithmetic pipelines –Design of Pipelined instruction unit-Principles of Designing Pipeline Processors- Instruction prefetch and branch handling- Data Buffering and Busing Structure-Internal forwarding and register tagging, Hazard detection and Resolution, Dynamic pipelines and Reconfigurability

UNIT-III: Introduction To Dataflow And Multi-Processor Systems (10 hours) Dataflow computers - Data driven computing and Languages, Data flow computers architectures - Static data flow computer, Dynamic data flow computer, Data flow design alternatives.Multi-Processors: Centralized vs. distributed shared memory, Interconnection topologies, Multiprocessor architecture, Symmetric multiprocessors, Cache coherence problem, memory consistency, Multicore architecture

UNIT-IV: Concepts Of Memories And Process Management (14 hours) Virtual memory: Use of memory by programs, Address translation, Paging, Cache memory: Organization, impact on programming.Operating systems: Processes and system calls, Process management, Program profiling, File systems: Disk management, Name management, Protection, Parallel architecture: Inter-process communication, Synchronization, Mutual exclusion, Basics of parallel architecture, Parallel programming with message passing using MPI.

TEXTBOOK:
1. Hennessey and Patterson, "Computer Architecture: A Quantitative Approach", Morgan Kaufman.2004.

REFERENCE BOOK
1. K. Hwang, F. A. Briggs, "Computer architecture and parallel processing", McGraw-Hill.

OBJECT ORIENTED ANALYSIS AND DESIGN

Category: Programme elective course

Prerequisites: Software Engineering
Course Objectives:
To train students on object modeling

To apply unified process phases
To apply unified modeling language for software design of any applications
To study case studies for OOAD

Learning Outcome: Will be able to use UML notations
Can apply unified process in software development
Will be able to perform analysis and design using object modelling

UNIT-I (10 Hours)

Introduction to UML: Importance of modeling, principles of modeling, Object oriented modeling, Conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT-II (10 Hours)

Basic BehavioralModeling: Interactions, Use cases, Use case Diagrams, Interaction diagrams, Activity Diagrams

UNIT-III (08 Hours)

Basic Structural Modeling: Classes, Relationships, Common Mechanisms, Diagrams., Class diagrams

UNIT-IV (12 Hours)

Advanced BehavioralModeling: Events and signals, State machines, Processes and Threads, Time and space, State chart diagrams. Advanced Structural Modeling Advanced classes, Advanced Relationships, Interfaces,Types and Roles, Packages,Instances Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams. Case Study: The Unified Library application.

TEXT BOOKS:

1. The Unified Modeling Language User Guide Grady Booch, James Rumbaugh, Ivar Jacobson,
   Pearson Education.
2. UML 2 ToolkitHans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, WILEY-Dreamtech India Pvt. Ltd.

REFERENCE BOOKS:

1. Fundamentals of Object Oriented Design in UML Meilir Page-Jones,Pearson Education.
2. Modeling Software Systems Using UML2, Pascal Roques:, Wiley- Dreamtech India Pvt. Ltd.
3. Object Oriented Analysis &Design,AtulKahate:, The McGraw Hill Companies.
4. Practical Object-Oriented Design with UML Mark Priestley:,TATA McGraw Hill.
5. Appling UML and Patterns: An introduction to Object–Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

PARALLEL COMPUTING

Category: Programme elective course
Pre-requisite: Computer Organization and System Architecture, Data Structures, Operating Systems
Course Objective: The objective is to familiarize students with the fundamental concepts, techniques and tools of parallel computing.
Learning Outcome: Students will have a clear understanding of parallel hardware constructs, Instruction-level parallelism, supercomputer architecture, multicore processor design.

UNIT-I: Foundation of Parallel Computing (10 hours)

Theory of Parallelism: Concept of Parallel Processing, Evolution(Four Decades of Computing), Challenges, Applications of Parallel Processing, Flynn's Classification, The State of Computing, SIMD Architecture, MIMD Architecture: Shared Memory and Message Passing Organization, Multiprocessors and Multicomputer

UNIT-II: Parallel Computing Architecture (10 hours)

Interconnection Networks: Classification criteria, Introduction to different Multiprocessors Interconnection Networks, Conditions of Parallelism, Performance Issues of Interconnection Networks, Routing in Interconnection Networks, Amdahl's law, Gustafson-Barsis's Law

UNIT-III: Shared-Memory Architecture (10 hours)

Shared memory Architecture- Classification of Shared Memory Systems, Bus-Based Symmetric Multiprocessors, Basic Cache Coherency methods, Snooping Protocols for Cache Memory, Message Passing Architecture

UNIT-IV: Programming Techniques (10 hours)

Abstract Models, Introduction to Message Passing Interface (MPI) and OpenMPI, Parallel Programming in the Parallel Virtual Machines, Granularity of Tasks

TEXT BOOKS:

1. Hesham El-Rewini and MostafaAbd-El-Barr, "Advanced Computer Architecture and Parallel Processing", Wiley
2. Kai Hwang and NareshJotwani, "Advanced Computer Architecture", 2nd Edition, McGrawHill.

REFERENCE BOOK:

1. Kai Hwang and Faye A. Briggs, "Computer Architecture And Parallel Processing

GRID COMPUTING

Category: Programme elective course
Prerequisite: Operating Systems, Data Structures, and Distributed Computing, Design and Analysis ofAlgorithms
Learning Objectives: The objective is to learn emerging techniques in Cluster and Grid computing and its applications, fault tolerance and security in Grids.

Learn different Resource Allocation Schemes, Task scheduling algorithms, High-Throughput Computing, and knowledge about GridSim, Gridlet, and Grid Secuirty.

Learning Outcome: On completion of this subject the student is expected to be able to understand emerging distributed technologies.

UNIT-I: Basics Of Distributed Systems (10 hours)

Introduction-Different form of computing,Strengths and Weakness of distributed computing, operating system concepts, Relevant to distributed computing, The architecture of distributed Applications, paradigm for distributed applications, choosing a paradigm for an application(Trade-Off).

UNIT –II: Parallel and Cluster Computing: (10 hour)

Parallel computing overview, Parallel Programming Models andParadigms.Introduction to Cluster Computing, Scalable Parallel Computer Architectures, Cluster Computer and its Architecture, Classifications, Components for Clusters, Cluster Middleware and Single System Image.

UNIT -III: Introduction to Grid Computing (10 hours)

Introduction to Grid Computing, Grid computing anatomy- Architecture, Applications of Grid Computing, Types of grids: Computational, Data, Desktop, Enterprise and Utility Grids, relationship to other distributed technologies, grid computing roadmap.

UNIT-IV:Grid Service Architecture (10 hours)

Merging Grid service architecture with the web service architecture. Open grid service architecture: Introduction Atchitecture and goal, Simple use cases: Commercial data centers, National Fusion collaboratory, online media and entertainment, OGSA Platform components, infrastructure.

TEXT BOOKS:

1. Distrbuted Computing, principles and applications, M.L.Liu,Pearson Education, 2004.
2. (Edited By) I. Foster and C. Kesselman, The Grid: Blueprint for a New Computing Infrastructure, Morgan Kaufmann, Elsevier, 2004.
3. Raj KumarBuyya, High Performance Cluster Computing: Architectures and Systems, Volume 1, Pearson Education, 2008.
4. Grid Computing, Joshy,Joseph and Craig fellenstein, Pearson Education 2004.

REFERENCE BOOKS:

1. Chakrabarti, Grid Computing Security, Springer, 2007.
2. Wilkinson, Grid Computing: Techniques and Applications, CRC Press, 2009.
3. S. R. Prabhu, Grid and Cluster Computing, PHI, 2008.
4. Janakiram, Grid Computing, Tata McGraw-Hill, 2005

MOBILE COMPUTING

Category: Programme elective course

Prerequisite: Data communication and Computer Networks

Learning Objectives: The objective is to learn emerging techniques in GSM, wireless MAC**.**

Learn mobile network and transport layer.

Learn mobile database, data disseminationand MANAT protocols

Learning Outcome: On completion of this subject the student is expected to be able to understand Mobile Computing.

UNIT – I: INTRODUCTION, GSM, WIRELESS MAC (10 Hours)

Introduction to Mobile Communications and Computing: Mobile Computing (MC):Introduction to MC, novel applications, limitations, and architecture. GSM: Mobile services, System architecture, Radio interface, Protocols, Localization andcalling, Handover, Security, and New data services. Wireless Medium Access Control : Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

UNIT – II: MOBILE NETWORK AND TRANSPORT LAYER (10Hours)

Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packetdelivery, agent advertisement and discovery, registration, tunneling and encapsulation, Optimizations), Dynamic Host Configuration Protocol (DHCP). Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT – III: MOBILE DATABASE AND DATA DISSEMINATION (10 Hours)

Database Issues: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues. Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

UNIT – IV: MANAT, PROTOCOLS (10 Hours)

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

Protocols and Tools: Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

TEXT BOOKS :

1. Jochen Schiller,"Mobile Communications",Addison-Wesley.
2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing"

REFERENCES:

1. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", ISBN: 0521817331, Cambridge University Press.
2. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill Professional.
3. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer.
4. Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley DreamTech.

Programme Elective-IV

SIMULATION AND MODELING

Category: Programme Elective Course
Prerequisites: Concepts of system and Programming languages
Course Objectives:

- Introduce computer simulation technologies and techniques, provides the foundations for the student to libraries and programs.
- This course focuses what is needed to build simulation software environments and not just building simulations using preexisting packages.
- Understand computer simulation needs ,and to implement and test a variety of simulation and data analysis.
- Build tools to view and control simulations and their results.

Learning Outcomes:

- Provide a strong foundation on concept of simulation and modeling.
- Understand the techniques of random number generations and testing randomness.
- Design simulation models for various case like inventory, traffic flow networks, etc.
- Practice on simulation tools and impart knowledge on building simulation Systems.

UNIT – I: System Model (10 Hours)

System definition and components, System Environment, Stochastic Activities, Continuous and Discrete Systems, System Modeling, Types of models, Static and Dynamic Physical Models, Static and Dynamic Mathematical Models, Principles used in Modelling, System Studies, Types of system study.

UNIT – II: System Simulation (10 Hours)

System simulation, why & when to simulate, nature and techniques of simulation, Monte Carlo Method, Comparison of simulation and analytical methods, Types of system simulation, Numerical Computation Technique for Continuous Models, Numerical Computation Technique for Discrete Models, Single-server queuing system, Distributed Lag models, Cobweb model, Progress of a Simulation study.

UNIT – III: Continuous system simulation and Probability concepts (10 Hours)

Continuous System Simulation, Analog vs. Digital Simulation, Hybrid Computers, Continuous System Simulation Languages (CSSLs), CSMP-III, Hybrid Simulation, water reservoir system, simulation of an autopilot, Real time Simulation. Discrete system simulation, fixed time-step , generation of random numbers, Simulation of a telephone System, Simulation Programming Tasks, test for randomness, Discrete simulation languages.

UNIT – IV: system dynamics, GPSS and SIMSCRIPT (10 Hours)

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams. Introduction to GPSS, simulation of Manufacture Shop, Gathering Statistics,Data structure in GPPS, Evaluation of Simulation Algorithm in GPSS. Introduction to SIMSCRIPT:Program, system concepts, origination, and statements, defining the telephone system model, Data structure in SIMSCRIPT, Evaluation of Simulation Algorithm in SIMSCRIPT.

TEXT BOOKS:

1. Geoftrey Gordon, " System Simulation",2/e, PHI

REFERENCE BOOKS:

1. Jerry Banks, John S. C Barry L. Nelson David M. Nicol, "Discrete Event System Simulation", Pearson Education.
2. NarsinghDeo, System Simulation with Digital Computer, PHI
3. V P Singh, "System Modeling and simulation", New Age International.
4. Averill M. Law, W. David Kelton, "System Modeling and simulation and Analysis", TMH

WIRELESS COMMUNICATIONS

Category: Programme Elective Course
Prerequisites: Concepts of Computer Network
Course Objectives:

- Introduce Wireless Communication.
- This course focuses to learn WLL, LMDS, WLAN, PAN
- This course focuses to learn FDMA, TDMA, CDMA, capacity of cellular system .

Learning Outcomes:

Provide a strong foundation on concept of mobile computing to the students.

UNIT – I: (10 Hours)

Evolution of mobile radio communication, mobile radio telephony in entire world, examples of wireless communication system, 2G cellular networks, 3G wireless networks, WLL, LMDS, WLAN, PAN

UNIT – II:(10 Hours)

Frequency reuse, channel assignment strategies, hand off strategy, interference & system capacity, trunking& grade of service, improving coverage & capacity in cellular system, introduction to radiowave propagation, three basic propagation mechanisms, reflection, ground reflection model (two ray), Okumura model, Hata model.

UNIT – III: (10 Hours)

Small scale multipath propagation, Types of small scale fading, Rayleigh & Rician Distribution, AM, FM, PM, linear modulation techniques, constant envelope modulation, hybrid modulation, spread spectrum modulation.

UNIT – IV: (10 Hours)

Equalization, training an adaptive equalizer, diversity technique, Rake receiver, multiple access, FDMA, TDMA, CDMA, capacity of cellular system.

TEXT BOOKS:

1. Wireless Communication, T. S. Rappaport, PHI

ADVANCED COMPUTER NETWORK

Category: Programme Elective Course
Prerequisite: Basic Computer Network

Learning Objective:
1 Fundamentals of network design
2 Advanced network topics
3 Understanding VPN, Tunneling and Overlay Networks
4 Understanding Mobile Ad-Hoc Network.
5 To read, write, and present work on networking.

Learning Outcome: This course enables us to understand the concepts of advancement of computer networkand its applications.

UNIT –I:INTRODUCTION (10 Hours)

Network and Internet,Routing and Internetworking, Intradomain Routing Protocols, Interdomain Routing Protocols.

UNIT –II: WIRELESS NETWORKS : (10 Hours)

Infrastructure of Wireless Networks, Wireless LAN Technologies, IEEE 802.11 Wireless Standard.

UNIT –III: VPNS, TUNNELING AND OVERLAY NETWORKS(10 Hours)

Virtual Private Networks (VPNs), Multiprotocol Label Switching (MPLS), Overlay Networks – VoIP and Multimedia Networking: Overview of IP Telephony, VoIP Signaling Protocols, Real-Time Media Transport Protocols, Distributed Multimedia Networking, Stream Control Transmission Protocol.

UNIT –IV: MOBILE AD-HOC NETWORKS(10 Hours)

Overview of Wireless Ad-Hoc Networks, Routing in Ad-Hoc Networks, Routing Protocols for Ad-Hoc Networks – Wireless Sensor Networks: Sensor Networks and Protocol Structures, Communication Energy Model, Clustering Protocols, Routing Protocols

TEXT BOOKS:

1. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, Keith W.Ross, Third Edition, Pearson Education, 2007
2. Computer and Communication Networks, Nader F. Mir, Pearson Education, 2007

REFERENCE BOOKS:

1. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition, Tata McGraw Hill, 2007
2. Guide to Networking Essentials, Greg Tomsho,Ed Tittel, David Johnson,FifthEdition, Thomson.
3. An Engineering Approach to Computer Networking, S.Keshav, PearsonEducation.

EMBEDDED SYSTEMS

Category: Programme Elective Course.

Prerequisite: Digital Electronics, Microprocessor and Microcontroller and Basic Computer Network

Learning Objective: **A**bility to understand the design concept of embedded systems, real time interfacing of sensors, actuators to microcontrollers.

Learning Outcome: Students will get the fundamentals knowledge of embedded system design

UNIT – I: (10 Hours) Overview of Embedded Systems: Embedded System, Categories and Requirements of Embedded Systems, Challenges and Issues in Embedded System Development, Applications of Embedded Systems in various domains.

UNIT – II: (10 Hours)

Embedded Design cycle:Embedded Hardware & Software Design & Development Process & Environment: Hardware Architecture, Interfacing Processor, Memories, I/O and Communication Interface Standards, Embedded Operating systems, Types of Embedded Operating systems.

UNIT – III: (10 Hours)

Microcontroller: 8/16/32 Bit (8051/ AVR/PIC/ARM/MSP 430) Microcontrollers and an overview of their Architecture, Instruction set, Interface & Applications. Programming Concepts

and Embedded Programming in C for Device Drivers for interfacing LCD, ADC, sensors, stepper motor, key board, DAC, memory.Embedded System-on Programmable Chip (SOPC): FPGA based soft & hard processor, Embedded Software development on FPGA

UNIT – IV: (10 Hours)

Embedded real time operating systems: Typical real time applications, Hard Vs Soft real-time systems, A reference model of Real Time Systems: Inter-process Communication and Synchronization of Processes, Tasks and Threads- Multiple Process in an Application, Problem of Sharing data by multiple tasks & routines, Scheduling, Commonly used Approaches to Real Time Scheduling Clock Driven, Weighted Round Robin, Priority Driven, Dynamic Vs State Systems, Effective release time and Deadlines, Offline Vs Online Scheduling.Embedded systems case studies.

TEXT BOOKS:

1. Embedded Systems Architecture, Programming and Design, Second Edition, Raj Kamal, Tata Mc-Graw Hill
2. The 8051 Microcontroller and Embedded Systems using Assembly and C, Mazidi, Mazidi, McKinlay, Second Edition, Pearson Education.
3. PIC Microcontroller and Embedded Systems using assembly and C for PIC18, Mazidi, MCKINLAY, CAUSEY, Pearson Education.
4. ARM Systems Developers Guides- Design & Optimizing System Software - Andrew N. Sloss, Dominic Symes, Chris Wright, 2004, Elsevier.
5. Jean J. Labrosse, "Embedded Systems Building Blocks: Complete and Ready-To-Use Modules in C", The publisher, Paul Temme, 2003.

REFERENCE BOOKS:

1. Introduction to Embedded Systems, Shibu K V, Tata Mc-Graw Hill.
2. PIC Microcontroller by H.W Huang, Delmar CENGAGE Learning, 2007.
3. J B Peatman, Design with PIC Microcontrollers, Prentice Hall.
4. Dr.K.V.K.K.Prasad, 'Embedded/Real-Time Operating System',Dreamtech Press(for Units I,II &III).
5. Daniel W. Lewis, "Fundamentals of Embedded Software where C and Assembly meet", PHI, 2002. 6. SteaveFurber, "ARM system – on – chip architecture" Addison Wesley, 2000.

GAME PROGRAMMING

Category: Programme Elective Course.

Prerequisite: Basic Computer science

Learning Objective: To provide fundamentals knowledge of game programming.

Learning Outcome: Students will Able to understand game programming

UNIT I (8 Hours)

Introduction to game programming, suitable languages for developing games and reasons, animation framework, worms in windows and applets,full screen worms.

UNIT II (12 Hours)

Introduction to java imaging, image loading, visual effects and animation.Loading and playing sounds, audio effects and synthesis, and sprites. Side scroller, isometric tile game, 3-D check board and checkers3-D, loading
and managing external models, lathe to make shapes, 3D- sprites

UNIT III (10 Hours)

Networking basics, network chat, networked two-person game, networked

virtual environment.

UNIT IV **(10 Hours)**

Game production and project management, game industry roles and economics, the publisher developer relationship, marketing, intellectual property content, law and practice, content regulation.

TEXT BOOKS

1. Andrew Davison, Killer Game programming in Java, O'Reilly Publishers, 2005.
2. Steve Rabin, Introduction to Game Development, CENGAGE Technology, 2009.

REFERENCE BOOKS

1. David Brackeen, Developing Games in Java, 2004.
2. David M Bourg & Glenn Seemann, AI for Game Developers, O'Reilly Publishers, 2004.

WEB RESOURCE

http://www3.ntu.edu.sg/home/ehchua/programming/java/J8d_Game_Framework.html.

Programme Elective-V

MANAGEMENT INFORMATION SYSTEM

Category: Programme Elective Course.

Prerequisite: Basic Software Engineering.

Course Objective: The objective of the course is to develop the basic understanding of the decision support system of the artificialintelligence for business organization.Implication of emerging trends in technology.

Learning Outcome: Students will Able to understand management information system.

Unit – I:(10 Hours)

Management Information system: Introduction, objective, definition, benefits, characteristics of MIS, , information system level, types of information system, resistance to MIS, implementing MIS,features of MIS, components of MIS.

Unit – II: (10 Hours)

Managerial decision making: Decision making process, problem solving techniques, how decisions are being supported – decisions styles group, Simon Model of decision making, features of various CBIS. Decision support system overview - relevance, scope, characteristic and capabilities, components and classification of DSS Decision support System: Introduction, architecture, components, limitation, development.

Unit – III: (08 Hours)

Database management system: Objective, characteristics, components and use of DBMS, types of database, Role of DBA. Model base management system: types of models, certainty, uncertainty, risk

Unit – IV: (12 Hours)

Information Security challenges in E-enterprise : Introduction, Security Threats and Vulnerability, Controlling Security Threat and Vulnerability, Management Security Threat in E-business, Disaster Management, MIS and Security Challenges,Software security: threats, method of safety, cryptography, digital signature.Introduction to Emerging trends technology, Expert System, knowledge management, A.I., data mining,data warehousing,

Suggested Readings

TEXT BOOKS

1. Keen, peter G.W.: Decision Support System an Organisational Perspective Addison-Wesley Pub.
2. Theierauff, Robert J. Decision Support System for effective planning – Prentice Hall – 1982.

REFERENCE BOOKS

1 Kroger, Donald W., and Hugh J. Watson Computer Based Information System New York, 1984.
2. Davis, Michael W. A management Approach – Macmillan Publishing company, Prentice Hall, New Jersey,1988.
3. Andrew P. Decision support System Engineering, Sage, John Wiley & Sons, New York

DISTRIBUTED DATABASE SYSTEM

Category: Programme Elective Course.

Prerequisite: A course on "Database Management Systems"

Learning Objective: To acquire knowledge on parallel and distributed databases and its applications.
To study the usage and applications of Object Oriented databases.
To learn the modeling and design of databases
To acquire knowledge on parallel and distributed databases and its applications.
Equip students with principles and knowledge of parallel and object oriented databases.
Topics include distributed DBMS architecture and design; query processing and optimization; distributed transaction management and reliability; parallel and object database management systems.

Learning Outcome: Understand theoretical and practical aspects of distributed database systems.
Study and identify various issues related to the development of distributed database system.
Understand the design aspects of object oriented database system and related development.

UNIT – I **(08 Hours)**

Features of Distributed versus Centralized Databases, Principles of Distributed Databases, Levels Of Distribution Transparency, Reference Architecture for Distributed Databases, Types of Data Fragmentation, Integrity Constraints in Distributed Databases, Distributed Database Design

UNIT – II **(12 Hours)**

Translation of Global Queries to Fragment Queries, Equivalence transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.Optimization of Access Strategies, A Framework for Query Optimization, Join Queries, General QueriesThe Management of Distributed Transactions, A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural Aspects of Distributed Transactions Concurrency Control, Foundation of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control.

UNIT – III **(08 Hours)**

Reliability, Basic Concepts, Nonblocking Commitment Protocols, Reliability and concurrency Control,Determining a Consistent View of the Network, Detection and Resolution of Inconsistency,Checkpoints and Cold Restart, Distributed Database Administration, Catalog Management inDistributed Databases, Authorization and Protection

UNIT – IV **(12 Hours)**

Architectural Issues, Alternative Client/Server Architectures, Cache Consistency, Object Management, Object Identifier Management, Pointer Swizzling, Object Migration, Distributed ObjectStorage, Object Query Processing, Object Query Processor Architectures, Query Processing Issues,Query Execution, Transaction Management, Transaction Management in Object DBMSs,Transactions as ObjectsDatabase Integration, Scheme Translation, Scheme Integration, Query Processing Query ProcessingLayers in Distributed Multi-DBMSs, Query Optimization Issues Transaction Management Transactionand Computation Model, Multidatabase Concurrency Control, Multidatabase Recovery, ObjectOrientation and Interoperability, Object Management Architecture CORBA and Databaseinteroperability,

Distributed Component Object Model, COM/OLE and Database Interoperability,PUSH-Based Technologies

TEXT BOOKS:

1. Distributed Databases Principles & Systems, Stefano Ceri, Giuseppe Pelagatti, TMH.
2. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez , Pearson Education, 2nd Edition.

REFERENCE BOOKS:

1. Distributed Database Systems, Chanda Ray, Pearson.
2. Distributed Database Management Systems, S. K. Rahimi and Frank. S. Haug, Wiley.

BIG DATA ANALYTICS

Category: Programme Elective Course

Prerequisite: Basic Computer Network, Cloud Computing and Database system.

Learning Objective:

1 Fundamentals of Big data
2 Fundamental of Mapreduce
3 Information Management and Data Privacy and Ethics

Learning Outcome: This course enables us to understand the concepts of Big data analysis

UNIT I **(08 hours)**

Introduction: Big data and its importance, a flood of mythic "start up"proportions, big data is more than merely big why now? a convergenceof key trends, a wider variety of data, the expanding universe of unstructureddata, industry examples of big data: Digital marketing and the online world,the right approach, cross channel lifecycle marketing.

UNIT II **(12 hours)**

Big Data Technology: The elephant in the room: Hadoop's parallel world, old vs. new approaches. Data discovery: Work the way people's minds work, open source technology for big data analytics, the cloud and big data, predictive analytics moves into the limelight, a brief history of hadoop, apache hadoop and the hadoop ecosystem.

MapReduce: Analyzing the data with hadoop, map and reduce, java mapreduce, scaling out, data flow, combiner functions, running a distributedmapreduce job, hadoop streaming, the hadoop distributed file system, thedesign of HDFS, HDFS concepts, blocks, name nodes and data nodes, HDFS federation, HDFS high, availability, the command, line interface, basic file system operations, hadoop file systems.

UNIT III **(10 hours)**

Information Management: The big data foundation, big data computingplatforms, big data computation, more on big data storage, big datacomputational limitations, big data emerging technologies. Business analytics : The last mile in data analysis, geospatial intelligence will make your life better, consumption of analytics, from creation to consumption. Visualizing: How to make it consumable? organizations are using data visualization as a way to take immediate action.

UNIT IV **(10 hours)**

Data Privacy and Ethics : The privacy landscape, the great data grabisn't new, preferencess, personalization, and relationships, rights andresponsibility, playing in a global sandbox , conscientious and conscious responsibility, privacy may be the wrong focus can data be anonymized?balancing for counter intelligence.

TEXT BOOK

1. Michael Minelli, Michele Chambers, Big Data,Big Analytics, Wiley Publications, 2013

2. Tom White, Hadoop: The Definitive Guide, 3/e, O'Reilly Publications, 2012.

REFERENCE BOOK

1. Bill Franks Taming, The Big Data Tidal Wave, 1/e, Wiley, 2012.
2. Frank J. Ohlhorst, Big Data Analytics, 1/e, Wiley, 2012

NETWORK MANAGEMENT

Category: Programme Elective Course

Prerequisite: Basic Computer Network..

Course Objective:

1 Fundamentals of Network monitoring
2 Fundamental of SNMP.
3 Remote Network Monitoring

Learning Outcome: This course enables us to understand the concepts of Network management.

UNIT I **(08 Hours)**

Introduction: Network management requirements, network management system. Network Monitoring: Network monitoring architecture, performance monitoring, fault monitoring, accounting monitoring.Network Control: Configuration control, security control.

UNIT II **(12 Hours)**

SNMP Network Management Concepts: Background, basic concepts. SNMP Management Information: Structure of management information, practical issues. Standard MIB: MIB-II, ethernet interface MIB. Simple Network Management Protocol: Basic concepts, protocolspecifications, transport level support, SNMP group.

UNIT III **(10 Hours)**

Remote Network Monitoring: Statistics collection, basic concepts, groups,statistics, history, host, hostTopN, matrix, token ring extensions to RMON.Remote Network Monitoring: Alarms and filters: Groups: alarm, filter,packet capture, event. RMON2: Overview, protocol directory group,protocol distribution group, address map group, RMON2 host groups,MON2 matrix groups, user history collection groups, probe configurationgroup, extensions to RMON1 for RMON2 devices.

UNIT IV **(10 Hours)**

SNMPv2: Management Information: Background, structure of managementinformation.SNMPv2: Protocol: Protocol operations, transport mappings, coexistence with SNMPv1. SNMPv2: MIBs and conformance: SNMPv2 management information base, conformance statements, evolution of the interfaces group of MIB-II.**SNMPv3:** Cryptographic Algorithms in SNMPv3: Conventional encryption with DES, the MD5 secure hash function, the SHA-1 secure hash function, message authentication with HMAC SNMPv3: Architecture and Applications: Background, SNMPv3 overview, SNMPv3 architecture, SNMPv3 applications, MIBs for SNMPv3 applications.

TEXT BOOK

1. William Stallings, SNMP, SNMPv2, SNMPv3, AND RMON1 and 2, 3/e,Pearson Education, 1998.

REFERENCE BOOKS

1 Mani Subramanian, Network Management Principles and Practice, Pearson Education, 2012.

INTRODUCTION TO BIOINFORMATICS

Category: Programme Elective Course

Prerequisite: Basics of Algorithm, Biology

Course Objective: To understand basic concepts of molecular biology and genetics, the concepts of computer science that relate to problems in biological sciences, computer as a tool for biomedical research, and important functional relationships from gene data.

Learning Outcome: Know about recent developments in database technologies

UNIT –I:INTRODUCTION (08 Hours)

Need for Bioinformatics technologies – Overview of Bioinformatics technologies Structural bioinformatics – Data format and processing – Secondary resources and applications – Role of Structural bioinformatics - Biological Data Integration System.

UNIT –II: DATAWAREHOUSING AND DATAMINING IN BIOINFORMATICS (08 Hours)

Bioinformatics data – Data warehousing architecture – data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture and applications in bioinformatics

UNIT –III: MODELING FOR BIOINFORMATICSAND PATTERN MATCHING (14 Hours)

Hidden markov modeling for biological data analysis – Sequence identifiation –Sequence classifiation – multiple alignment generation – Comparative modeling –Protein modeling – genomic modeling – Probabilistic modeling – Bayesian networks – Boolean networks Molecular modeling – Computer programs for molecular modeling.

Gene regulation – motif recognition – motif detection – strategies for motif detection – Visualization – Fractal analysis – DNA walk models – one dimension – two dimension – higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences.

UNIT –IV: MICROARRAY ANALYSIS (10 Hours)

Microarray technology for genome expression study – image analysis for data extraction – preprocessing – segmentation – gridding – spot extraction – normalization, fitering – cluster analysis – gene network analysis – Compared Evaluation of Scientifi Data Management Systems – Cost Matrix – Evaluation model - Benchmark – Tradeoffs.

TEXT BOOKS:

1. Yi-Ping Phoebe Chen (Ed), "BioInformatics Technologies", First Indian Reprint, Springer Verlag, 2007.
2. Zoe lacroix and Terence Critchlow, "BioInformatics – Managing Scientifi data", First Indian Reprint, Elsevier, 2004

REFERENCE BOOKS:

1. Zoe Lacroix and Terence Critchlow, "Bioinformatics – Managing Scientifi Data", First Edition, Elsevier, 2004
2. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2003.
3. Arthur M Lesk, "Introduction to Bioinformatics", Second Edition, Oxford University Press, 2005

Programme Elective- VI

STORAGE AREA NETWORK

Category: Programme Elective Course
Prerequisite: Knowledge of Computer Networks and DBMS
Learning Objective: To learn H/W and S/W architecture, various features of Storage area Network (SAN) as well as its applications.
Learning Outcome: Concept, Architecture and design of SANs

UNIT –I:INTRODUCTION AND INTELLIGENT DISK SUBSYSTEMS (10 Hours)

Introduction: Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks .The Data Storage and Data Access problem; The Battle for size and Access

Intelligent Disk Subsystems: Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels; JBOD, Storage virtualization using RAID and different RAID levels; Caching: Acceleration of Hard Disk Access; Intelligent disk subsystems, Availability of disk subsystems

UNIT –II: I/O TECHNIQUES, NETWORK ATTACHED STORAGE AND FILE SYSTEM AND NAS (10 Hours)

I/O Techniques : The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage

Network Attached Storage: The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system.

File System and NAS: File System and NAS:Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.

UNIT –III: STORAGE VIRTUALIZATION AND SAN ARCHITECTURE & HARDWARE DEVICES(10 Hours)

Storage Virtualization: Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric Storage virtualization in the Network SAN Architecture and Hardware devices : Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective.

UNIT –IV: SOFTWARE COMPONENTS OF SAN AND MANAGEMENT(10 Hours)

Software Components of SAN: The switch's Operating system; Device Drivers; Supporting the switch's components; Configuration options for SANs.

Management: Planning Business Continuity; Managing availability; Managing Serviceability; Capacity planning; Security considerations

TEXT BOOKS:

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks, Wiley India, 2007
2. Robert Spalding: Storage Networks The Complete Reference, Tata McGraw-Hill, 2003.

REFERENCE BOOKS:

1 Richard Barker and Paul Massiglia: Storage Area Network Essentials A Complete Guide to understanding and Implementing SANs, John Wiley India, 2002

SOFTWARE DESIGN AND VALIDATION

Category:	Programme Elective Course
Prerequisite:	Software Engineering
Learning Objective:	Understand the concepts and theory of advanced software design.
Learning Outcome:	Upon successful completion of the course the student will be able to: Be able to discuss the role of verification and validation in the software development lifecycle and able to apply appropriate testing techniques to verify and validate software requirements, designs, and implementations.

UNIT-I: Concepts Of Models (10 Hours)

System, Process and Product Engineering Hierarchies Requirement Engineering and its phases, Building the Analysis Models: Concepts, Data Flow Model, Control Flow Model, State Charts and Transition Models, Quality Function Deployment, Language and Tools, Requirements Validation Metrics.

UNIT-II:Software Design Concepts (10 Hours)

Software Design Concepts and Principles, Data Design, Software Architectural Styles, Analysis of Architectural Designs, Architectural Design Metrics, Design Structure Quality Index Estimation, User interface design models and process Interface Design Activities, Component Level Design and Notations, Component Level Design Metrics.

UNIT-III: Concept Of Software Architecture And Object-Oriented Design (10 hours)

Design quality, Design Concepts, The Design Model, Introduction to Pattern Based Software Design, Architecture styles: Main program with sub program style, Abstract data type style, Repository, Layered. Architectural Design: Software Architecture, Data Design and Architectural Design, User Interface Design: Rules, User Interface Analysis and Steps in Interface Design, Design Evaluation Design of Objects, Design and Factoring , Design of Software Objects ,Features and Methods, Cohesion of Objects , Coupling between Objects , Coupling and Visibility, Inheritance, Establishing The Object Model, Refining classes and associations, Analysis model vs. design model classes,

UNIT-IV: Introduction To Software Verification And Validation (10 Hours)

An Introduction to Software Verification and Validation/Basic Concepts, Software Quality/Maturity Model/Project presentation, Verification &Validation Planning and Scoping, Requirements for Verification &Validation, Architecture and Design Verification & Validation, Testing of Verification & Validation

TEXTBOOKS:

1. Roger Pressman. S., Software Engineering : A Practitioner s Approach, (4th Edition), McGraw Hill, 1997.
2. I. Sommerville, Software Engineering, V Edition: Adison Wesley, 1996.
3. Pfleeger, Software Engineering, Prentice Hall, 1999.
4. Carlo Ghezzi, Mehdi Jazayari, Dino Mandrioli Fundamentals of Software Engineering, Prentice Hall of India, 1991

REFERENCE BOOKS:

1.GradyBooch, James Rambaugh, Ivar Jacobson, "Unified Modeling Language User Guide", 2nd Edition, Addison- Wesley, ISBN – 0321267974.
2.JimArlow, IlaNeustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design.", 2nd Edition, Addison- Wesley, ISBN – 0321321278.

INTERNET OF THINGS

Category: Interdisciplinary Elective Course
Prerequisite: Basic Computer Network
Course Objective: 1.To Understand the Architectural Overview of IoT
2. Understand the vision of IoT from a global context.
3. Understand the application of IoT.
4. Determine the Market perspective of IoT.
Learning Outcome: The purpose of this course is to impart knowledge on IoT

UNIT –I:INTRODUCTION (10 Hours)

The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

UNIT –II: IOT ARCHITECTURE (10 Hours)

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoTarchitecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management..

UNIT –III: IOT LAYERS PROTOCOLS (10 Hours)

PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART,Z-Wave,Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

UNIT –IV: INTERNET OF THINGS PRIVACY, SECURITY AND GOVERNANCE (10Hours)

Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security.

TEXT BOOKS:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1stEdition, Academic Press, 2014
2 Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014

REFERENCE BOOKS:

1. Peter Waher, "Learning Internet of Things", PACKT publishing,BIRMINGHAM – MUMBAI
2. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet ofThings", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2,Springer

ADVANCED SOFTWARE ENGINEERING

Category: Programme Elective Course
Prerequisite: Software Engineering,
Learning Objective: To learn unified software development process
To learn Architecture Description Languages and UML
Learning Outcome: Students will get knowledge in designing advanced software

UNIT – I: **(10 Hours)**

Embedded software and systems engineering: overview, examples and industrial realities Project Management - Project Planning and Scheduling Standards, e.g. PSS-05; Case studies

UNIT – II: **(10 Hours)**

Unified Software Development Process Software Process Improvement Software Economics Software QualitySoftware Metrics - Measurement, Estimation and Prediction Requirements Management Configuration Management Risk Management Testing and Inspection

UNIT – III: **(10 Hours)**

Architecture Description Languages Pattern-Oriented Software Architecture Component-based Development Distributed Software Architectures using Middleware Enterprise Application Integration Architectures for Mobile and Pervasive Systems Model Driven Architecture

UNIT – IV: **(10 Hours)**

UML Extension Mechanisms Object Constraint Language Model Checking

TEXT BOOKS

1. Jacobson, J. Rumbaugh, G. Booch: The Unified Software Development Process. Addison Wesley. 1999
2. F. Buschmann, R. Meunier, H. Rohnert, P. Sommerlad, M. Stal: Pattern-Oriented Software Architecture. John Wiley. 1996
3. G. Booch, I. Jacobson, J. Rumbaugh: The Unified Modeling Language User Guide. Addison Wesley. 1999

REFERENCE BOOKS

1 H.B. Warmer, A. G. Kleppe: The Object Constraint Language: Precise Modeling With UML Addison Wesley. 1997

2 E. M. Clarke, O. Grumberg, D. Peled: Model Checking. MIT Press. 2000

3 A. Finkelstein (ed): The Future of Software Engineering. ACM Press. 2000

4 W. Emmerich: Distributed Component Technologies and their Software Engineering Implications. Proc. of the 24th Int. Conference on Software Engineering, Orlando,nFlorida. pp. 537-546. ACM Press. 2002. Also available from http://www.cs.ucl.ac.uk/staff/w.emmerich/publications/ICSE2002/SOA/

5 R. Hubert, D.A. Taylor: Convergent Architecture: Building Model Driven J2EE Systems with UML. Wiley 2002.

6 W. A. Ruh, F. X. Maginnis, W. J. Brown: Enterprise Application Integration. Wiley 2000

7 C. Mascolo, L. Capra and W. Emmerich: Middleware for Mobile Computing. In E. Gregori, G. Anastasi, S. Basagni (eds): Networking 2002 Tutorial Papers. Lecture Notes in Computer Science 2497. Springer Verlag 2002. http://www.cs.ucl.ac.uk/staff/w.emmerich/publications/Networking2002

8 W. Emmerich, E. Ellmer and H. Fieglein: TIGRA: An Architectural Style for Enterprise Application Integration. Proc. of 23rd Int. Conference on Software Engineering, Torontl, Canada. pp. 567-576. ACM Press. 2001. Available from: http://www.cs.ucl.ac.uk/staff/W.Emmerich/publications/ICSE2001/TIGRA

ETHICAL HACKING

Category: Programme Elective Course

Prerequisite: A course on "Operating Systems"
A course on "Computer Networks"
A course on "Network Security and Cryptography"

Course Objective: The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
The course includes-Impacts of Hacking; Types of Hackers; Information Security Models; Information Security Program; Business Perspective; Planning a Controlled Attack;Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation,Deliverable and Integration)

Learning Outcome: Gain the knowledge of the use and availability of tools to support an ethical hack
Gain the knowledge of interpreting the results of a controlled attack
Understand the role of politics, inherent and imposed limitations and metrics for planning of a testComprehend the dangers associated with penetration testing

UNIT – I **(10 Hours)**

Introduction: Hacking Impacts, The HackerFramework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, IntegrationInformation Security Models: Computer Security, Network Security, Service Security, Application Security, Security ArchitectureInformation Security Program: The Process of Information Security, Component Parts of
Information Security Program, Risk Analysis and Ethical Hacking

UNIT – II **(10 Hours)**

The Business Perspective: Business Objectives, Security Policy, Previous Test Results, Business Challenges Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, Timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

UNIT – III **(08 Hours)**

Preparing for a Hack: Technical Preparation, Managing the Engagement Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance

UNIT – IV **(12 Hours)**

Enumeration: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase Exploitation: Intutive Testing, Evasion, Threads and Groups, Operating Systems, Password
Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern Deliverable: The Deliverable, The Document, Overal Structure, Aligning Findings, Presentation Integration: Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy, Conclusion

TEXT BOOKS

1. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press

REFERENCE BOOKS:

1. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning
2. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning

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