B. Tech. (CSE) – Curriculum (NITTUGCSE14)

Semester-wise Curriculum

I Semester

Sl. No.	Code	Course Name	L	T	P	C
1	HM101	English for Communication	3	0	0	3
2	MA101	Mathematics I	3	0	0	3
3	PH101	Physics I	2	0	3	3
4	CH101	Chemistry I	2	0	3	3
5	ME101	Engineering Mechanics	3	0	0	3
6	CS101	Basics of Programming (Theory and Lab)	2	0	2	3
7	CC101	Energy and Environmental Engineering	2	0	0	2
8	MP101	Engineering Graphics	1	0	4	3
9	CF101	NSS/NCC/NSO	0	0	0	0

Total Credits: 23

II Semester

Sl. No.	Code	Course Name	L	T	P	C
1	HM102	Professional Communication	3	0	0	3
2	MA102	Mathematics II	3	0	0	3
3	PH102	Physics II	3	0	0	4
4	CH102	Chemistry II	3	0	0	4
5	BE I 102	Basic Civil Engineering	2	0	0	2
6	BE III 102	Basic Electrical & Electronics Engineering	2	0	0	2
7	BS102	Branch Specific Course in CSE	2	0	0	2
8	PR101	Workshop Practice	0	0	4	2
9	CF102	NSS/NCC/NSO	0	0	0	0

Total Credits: 22

III Semester

Course Code	Course Type	Course Name	L	T	P	C
CS201	Core	Data Structures and Algorithms	3	0	0	3
CS203	Core	Discrete Structures	3	1	0	4
CS205	Core	Digital Systems Design	3	0	0	3
CS207	Core	Data Communication	3	0	0	3
CS209	Core	Computer Organization	3	0	0	3
HM201	Core	Corporate Communication	3	1	0	4
CS213	Laboratory	Data Structures Laboratory	0	0	2	2
CS215	Laboratory	Digital Systems Design Laboratory	0	0	2	2

Total Credits: 24

IV Semester

Course Code	Course Type	Course Name	L	T	P	C
CS202	Core	Operating Systems	3	0	0	3
MA204	Core	Introduction to Probability Theory	3	1	0	4
CS206	Core	Computer Networks	3	0	0	3
CS208	Core	Automata and Formal Languages	3	1	0	4
CS210	Core	Advanced Algorithms	3	0	0	3
CS212	Core	Combinatorics and Graph Theory	3	0	0	3
CS214	Laboratory	Algorithms Lab	0	0	2	2
CS216	Laboratory	Operating Systems Laboratory	0	0	2	2

Total Credits: 24

V Semester

Course Code	Course Type	Course Name	L	T	P	C
CS301	Core	Computer Architecture	3	1	0	4
MA304	Core	Principles of Operations Research	3	1	0	4
CS303	Core	Internetworking Protocols	3	0	0	3
CS305	Core	Database Management System	3	0	0	3
CS307	Core	Software Engineering	3	0	0	3
E1	Elective	Elective – I	3	0	0	3
CS309	Laboratory	Networks Laboratory	0	0	2	2
CS311	Laboratory	DBMS Laboratory	0	0	2	2

Total Credits: 24

VI Semester

Course Code	Course Type	Course Name	L	T	P	C
CS302	Core	Principles of Cryptography	3	1	0	4
CS304	Core	Service Oriented Architecture	3	0	0	3
CS306	Core	Microprocessors and Microcontrollers	3	0	0	3
CS308	Core	Mobile Applications Development	3	0	0	3
E2	Elective	Elective – II	3	0	0	3
E3		Elective – III	3	0	0	3
CS310	Laboratory	Mobile Applications Development Lab	0	0	2	2
CS312	Laboratory	Microprocessors and Microcontrollers Laboratory	0	0	2	2

Total Credits: 23

VII Semester

Course Code	Course Type	Course Name	L	T	P	C
CS401	Core	Web Technology	3	0	0	3
CS403	Core	Parallel Architectures and Programming	3	0	0	3
CS405	Core	Principles of Compiler Design	3	0	0	3
CS407	Core	Network Security	3	0	0	3
E4	Elective	Elective – IV	3	0	0	3
E5		Elective – V	3	0	0	3
CS409	Laboratory	Web Technology Laboratory	0	0	2	2
CS411	Laboratory	Compiler Design Laboratory	0	0	2	2
CS449		Comprehensive Viva-Voce	3	0	0	3

Total Credits: 25

VIII Semester

Course Code	Course Type	Course Name	L	T	P	C
HM402	Core	Software Project Management	3	0	0	3
E6	Elective	Elective – VI	3	0	0	3
E7		Elective – VII	3	0	0	3
E8		Elective – VIII	3	0	0	3
CS498	Project	Project Work	6	0	0	6

Total Credits: 18

Summary

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	23	22	24	24	24	23	25	18	183

List of Electives

Odd Semester Electives

V Semester (1 out of 3)

- Human Computer Interaction : Software Systems
- Multimedia Systems : Software Systems
- Mobile Computing and Communication : Networking

VII Semester (2 out of 5)

- Big Data Analytics : Database
- Cloud Computing : Networking
- Artificial Intelligence and Expert Systems : Software Systems
- Programming for Embedded Systems : Systems
- Advanced Cryptography : Theoretical CS

Even Semester Electives

VI Semester (2 out of 5)

- Wireless Network Systems : Networking
- Design and Analysis of Parallel Algorithms : Theoretical CS
- Principles of Processor Design : Systems
- Data Warehousing and Data Mining : Database
- Real Time Systems : Software Systems

VIII Semester (3 out of 6)

- Randomized Algorithms : Theoretical CS
- Natural Language Processing : Software Systems
- Network Processors Design : Systems
- Image Processing : Software Systems
- Software Quality Assurance : Software Systems
- Advanced Database Management Systems : Database

Electives for B. Tech. (Honors)*

Sl. No.	Course Type	Course Name	L	T	P	C
HE1	Elective	Distributed Algorithms	3	0	0	3
HE2	Elective	High Speed Networks	3	0	0	3
HE3	Elective	Software Defined Networking	3	0	0	3
HE4	Elective	Transaction Processing Systems	3	0	0	3
HE5	Elective	Pervasive Computing	3	0	0	3
HE6	Elective	Programming for Multi Core Systems	3	0	0	3
HE7	Elective	Soft Computing	3	0	0	3
HE8	Elective	Digital System Testing and Verification	3	0	0	3
HE9	Elective	CAD for VLSI	3	0	0	3
HE10	Elective	Middleware Technologies	3	0	0	3

** - Eligibility Criteria: As per the existing institute norms*

FIRST SEMESTER

HM101 English for Communication

3-0-0-3

Objectives

- To develop in the under-graduate students of engineering a level of competence in English
- To develop effective communication for academic and social needs

Outcome

- Ability to in a meaningful manner to different levels of people in their academic and social domains

Unit – I

Communication An introduction - Its role and importance in the corporate world – Tools of communication – Barriers – Levels of communication – English for Specific purposes and English for technical purposes.

Unit – II

Listening process & practice – Exposure to recorded & structured talks, class room lectures – Problems in comprehension & retention – Note-taking practice – Listening tests- Importance of listening in the corporate world.

Unit – III

Reading Introduction of different kinds of reading materials: technical & non-technical – Different reading strategies: skimming, scanning, inferring, predicting and responding to content – Guessing from context – Note making – Vocabulary extension.

Unit – IV

Speaking Barriers to speaking – Building self-confidence & fluency – Conversation practice- Improving responding capacity - Extempore speech practice – Speech assessment.

Unit – V

Writing Effective writing practice – Vocabulary expansion - Effective sentences: role of acceptability, appropriateness, brevity & clarity in writing – Cohesion & coherence in writing – Writing of definitions, descriptions& instructions - Paragraph writing - Introduction to report writing.

Text Books

1. Krishna Mohan and Meenakshi Raman, “Effective English Communication”, Tata McGraw Hill, New Delhi, 2000
2. Meenakshi Raman and Sangeetha Sharma, “Technical Communication”, Oxford University Press, New Delhi, 2006

Reference Books

1. M. Ashraf Rizvi, “Effective Technical Communication”, Tata McGraw-Hill, New Delhi, 2005
2. Golding S.R., “Common Errors in English Language”, Macmillan, 1978
3. Christopher Turk, “Effective S peaking”, E & FN Spon, London, 1985

MA101 Mathematics I

3-0-0-3

Objective

- To acquire fundamental knowledge and apply in engineering disciplines.

Outcome

- Ability to solve engineering problems

Unit – I

Characteristic equation of a matrix –Eigen values and Eigen vectors – Properties of Eigen values – Diagonalization of matrix – Cayley-Hamilton Theorem (without proof) verification – Finding Inverse and Power of a matrix using it – Quadratic form – Definite and indefinite forms –Orthogonal reduction of quadratic form to canonical form.

Unit – II

Sequences of real numbers – Limit of a sequence – Convergent and divergent sequences– sub sequence- Cauchy's sequence – monotone convergence theorem (without proof)- Sequence with recurrence relations.

Unit – III

Infinite series-Convergence Tests for positive term series – Comparison, Root, Ratio and Raabe's tests - Alternating series – Leibnitz's rule – Absolute and Conditional Convergence. Riemann rearrangement theorem (without proof).

Unit – IV

Functions of several variables – Partial derivatives and Transformation of variables – Jacobian and its Properties- Maxima and Minima of function of two variables.

Unit – V

Double integral – Changing the order of Integration – Change of variables from Cartesian to Polar Coordinates – Area using double integral in Cartesian and Polar Coordinates – Triple integral – Change of Variables from Cartesian to Spherical and Cylindrical Coordinates – Volume using double and triple integrals.

Text Books

1. Kreyszig, E., Advanced Engineering Mathematics, 9thedition, John Wiley Sons, 2006
2. Grewal, B.S., Higher Engineering Mathematics, 42ndedition, Khanna Publications, Delhi, 2012.
3. M K Venkataraman, Engineering mathematics, Volume I, 2nd ed., National Publishing Co. 2003

Reference Books

1. Apostol, T.M., "Calculus Volume I & II" Second Edition, John Wiley & Sons, 2005
2. Greenberg, M.D., "Advanced Engineering Mathematics", Second Edition, Pearson Education Inc. (First Indian reprint), 2002
3. Strauss. M.J, Bradley, G.L., and Smith, K.J., "Calculus", 3rd Edition, Prentice Hall, 2002
4. T Veerarajan, "Engg Mathematics", McGraw-Hill Education (India) Pvt Limited, 2007

PH101 Physics I

(Common to all branches)

2-0-3-3

Objectives

- To make a bridge between the physics in school and engineering courses
- To introduce the basic concepts of modern science like Photonics, Engineering applications of acoustics, fundamentals of crystal physics and materials science

Outcomes

- Ability to understand many modern devices and technologies based on lasers and optical fibers
- Ability to understand various material properties which are used in engineering applications and devices.

Unit – I

Lasers Introduction to Laser-characteristics of Lasers-Spontaneous and stimulated emissions – Einstein's coefficients – population inversion and lasing action – laser systems: Ruby laser, He-Ne Laser, semiconductor laser-applications:–Holography- CD-drive – industrial and medical applications.

Unit – II

Fiber Optics Fermat's principle and Snell's law-optical fiber – principle and construction – acceptance cone - numerical aperture – V-Number - types of fibers, Fabrication: Double Crucible Technique, Vapour phase Oxidation Process – fiber optic communication principle – fiber optic sensors-other applications of optical fibers.

Unit – III

Acoustics Characteristics of musical sound – loudness – Weber-Fechner law – decibel – absorption coefficient – reverberation – reverberation time – Sabine's formula – acoustics of buildings – ultrasonics – production of ultrasonics using piezoelectric method – magnetostriction method- applications.

Unit – IV

Crystallography Crystalline and amorphous solids – lattice and unit cell – seven crystal system and Bravais lattices – symmetry operation – Miller indices – atomic radius – coordination number – packing factor calculation for sc, bcc, fcc – Bragg's law of X-ray diffraction – Laue Method- powder crystal method.

Unit – V

Magnetic materials, conductors and superconductors Magnetic materials: Definition of terms – classification of magnetic materials and properties – domain theory of ferromagnetism- hard and soft magnetic materials – applications. Conductors: classical free electron theory (Lorentz Drude theory) – electrical conductivity Superconductors: definition – Meissner effect – type I & II superconductors – BCS theory (qualitative) – high temperature superconductors – Josephson effect – quantum interference (qualitative) – SQUID – applications.

Text Books

1. M. N. Avadhanulu and P.G. Kshirsagar, "A text book of Engineering Physics", S. Chand and Company, New Delhi, 2009
2. R. K. Gaur and S. L. Gupta, "Engineering Physics", Dhanpat Rai Publications (P) Ltd., 8th edn., New Delhi (2001).

Reference Books

1. William T. Silfvast, "Laser Fundamentals", 2nd edn, Cambridge University press, New York, 2004
2. D. Halliday, R. Resnick and J. Walker, "Fundamentals of Physics", 6th Edition, John Wiley and Sons, New York, 2001
3. Charls Kittel, "Introduction to solid state physics",7th Edn, Wiley, Delhi, 2007

CH 101 CHEMISTRY I

(Common to all branches)

2-0-3-3

Objective

- To introduce students to water chemistry, bonding concepts, entropy and basic organic chemistry

Outcome

- Ability to learn about quality of water, bonding theories, entropy change for various processes and basic stereo chemical aspects

Unit – I

Water - Sources, hard & soft water, estimation of hardness by EDTA method, softening of water, zeolite process & demineralization by ion exchangers, boiler feed water, internal treatment methods, specifications for drinking water, BIS & WHO standards, treatment of water for domestic use, desalination - reverse osmosis & electrodialysis.

Unit – II

Chemical Bonding - Basic concepts, bonding in metals, electron gas theory, physical properties of metals (electrical & thermal conductivity, opaque & lusture, malleability & ductility), Alloy-substitutional alloys, interstitial alloys. Coordinate bond, EAN rule, 16 & 18 electron rule, crystal field theory, splitting of 'd' orbitals in octahedral, tetrahedral and square planar complexes.

Unit – III

Shape & Intermolecular Interactions - Shape-Lewis dot structures, formal charge, VSEPR method, consequences of shape, dipole moment, valence bond theory; Intermolecular interactions-ion ion interactions, ion-dipole interactions, hydrogen bonding, dipole-dipole interactions, London / dispersion forces, relative strength of intermolecular forces; Consequences-surface tension.

Unit – IV

Thermodynamics - Entropy as a thermodynamic quantity, entropy changes in isothermal expansion of an ideal gas, reversible and irreversible processes, physical transformations, work & free energy functions, Helmholtz and Gibbs free energy functions, Gibbs-Helmholtz equation, Gibbs-Duhem equation, Clapeyron-Clausius equation & its applications, Van't Hoff isotherm and applications.

Unit – V

Fuels & Lubricants - Fuels - Classification, examples, relative merits, types of coal, determination of calorific value of solid fuels, Bomb calorimeter, theoretical oxygen requirement for combustion, proximate & ultimate analysis of coal, manufacture of metallurgical coke, flue gas analysis, problems. Lubricants - Definition, theories of lubrication, characteristics of lubricants, viscosity, viscosity index, oiliness, pour point, cloud point, flash point, fire point, additives to lubricants, Solid lubricants.

Text Books

1. P.C. Jain, M. Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Company, New Delhi, 2005.
2. P. Atkins, J.D. Paula, “Physical Chemistry”, Oxford University Press, 2002

Reference Books

1. R. D. Madan, “Modern Inorganic Chemistry”, S. Chand & Company Ltd., New Delhi, 2012
2. M.J. Shultz, “Engineering Chemistry”, Cengage Learning, New Delhi, 2007

ME101 Engineering Mechanics

(Common to all branches)

3-0-0-3

Objectives

- To explain the importance of mechanics in the context of engineering and conservation equations
- To explain the significance of centroid, centre of gravity and moment of inertia.
- To introduce the techniques for analyzing the forces in the bodies.
- To apply the different principles to study the motion of a body, and concept of relative velocity and acceleration
- To describe the trajectory of a particle under projectile motion
- To identify the basic elements of a mechanical system and write their constitutive equations.

Outcomes

- Ability to identify and analyze the problems by applying the fundamental principles of engineering mechanics
- Ability to research, design and develop mechanical systems

Unit – I

Fundamentals Mechanics and its relevance, concepts of forces, laws of mechanics - parallelogram law, Lami's theorem, law of polygon, concept of free-body diagram, centroids, center of gravity, area moment of inertia, mass moment of inertia – simple and composite planes, Numerical.

Unit – II

Friction Laws of friction, static friction, rolling friction, application of laws of friction, ladder friction, wedge friction, body on inclined planes, simple screw jack – velocity ratio, mechanical advantage, efficiency, Numerical.

Unit – III

Statics Principles of statics, types of forces, concurrent and non-concurrent forces, composition of forces, forces in a plane and space, simple stresses and strains, elastic coefficients, Numerical.

Unit – IV

Kinematics Fundamentals of rectilinear and curvilinear motion, application of general equations, concept of relative velocity, analytical and graphical techniques, Numerical.

Unit – V

Dynamics Principles of dynamics, D'Alembert's principle, conservation of momentum and energy, vibrations of simple systems, Numerical.

Text Books

1. Kumar, K. L., Kumar, V. Engineering Mechanics, Pub.: Tata McGraw Hill, 2011.
2. Palanichamy, M. S., and Nagan, S., Engineering Mechanics – Statics & Dynamics, Pub.: Tata McGraw Hill, 2002.
3. Timoshenko, S. and Young, D. H., Engineering Mechanics, Pub.: McGraw Hill, 2006.

Reference Books

1. Popov, E. P., Engineering Mechanics of Solids, Pub.: Prentice Hall, 1998.
2. Shames, I. H. and Rao, G. K. M., Engineering Mechanics – Static and Dynamics, Pub.: Pearson Education, 2009.
3. Beer, F. P., and Johnson Jr. E. R., Vector Mechanics for Engineers, Pub.: McGraw Hill, Year of publication: 2009.
4. Rao, J. S. and Gupta, K., Introductory Course on Theory and Practice of Mechanical Vibrations, Pub.: New Age International, 1999.

CS101 Basics of Programming

2-0-2-3

Objectives

- To learn the fundamentals of computers
- To learn the problem solving techniques writing algorithms and procedures
- To learn the syntax and semantics for C programming language
- To develop the C code for simple logic
- To understand the constructs of structured programming including conditionals and iterations

Outcomes

- Ability to write algorithms for problems
- Knowledge of the syntax and semantics of C programming language
- Ability to code a given logic in C language
- Knowledge in using C language for solving problems

Unit – I

Introduction to computers – Computer Organization – Characteristics – Hardware and Software – Modes of operation – Types of programming languages – Developing a program.

Unit – II

Algorithms – Characteristics – Flowcharts - Principles of Structured programming – Sequential, selective structures - Repetitive structures –Bounded , Unbounded and Infinite iterations – Examples for each.

Unit – III

Introduction to C – C character set – Identifiers and Keywords – Datatypes – Constants – Variables – Declarations – Expressions – Statements – Symbolic constants – Operators– Library functions – Data input and output: Single character input and output – Entering input data – Writing output data – gets and puts functions. Control statements – Branching: if-else – Looping: while – do-while – for; Nested control structures – switch statement – break statement – continue statement – comma operator – goto statement.

Unit – IV

Modular Programming – Functions and Procedures – Examples – Parameter passing methods.

Unit – V

Arrays – Defining an array – Processing an array – Multidimensional arrays-Pointers – Variable definitions and initialization – Pointer operators – Pointer expressions and arithmetic – Pointers and one-dimensional arrays- Functions – Defining a function – Accessing a function – Function prototypes – Passing arguments to a function – Passing arrays to a function – Passing pointers to a function – Recursion.

Text Books

1. Byron Gottfried, "Programming with C", Third Edition, Tata McGraw Hill Education, 2010
2. R. G. Dromey, "How to Solve it By Computers?", Prentice Hall, 2001

Reference Books

1. J. R. Hanly and E. B. Koffman, "Problem Solving and Program Design in C", 6th Edition, Pearson Education, 2009.
2. Paul Deital and Harvey Deital, "C How to Program", Seventh Edition, Prentice Hall, 2012.
3. Yashavant Kanetkar, "Let Us C", 12th Edition, BPB Publications, 2012.

CC101 Energy and Environmental Engineering

2-0-0-2

Objectives

- To teach the principal renewable energy systems
- To explore the environmental impact of various energy sources and also the effects of different types of pollutants.

Outcomes

- Ability to explore the rincipal renewable energy systems
- Ability to explore the environmental impact of various energy sources and also the effects of different types of pollutants.

Unit – I

Present Energy resources in India and its sustainability - Different type of conventional Power Plant--Energy Demand Scenario in India-Advantage and Disadvantage of conventional Power Plants – Conventional Vs Non-conventional power generation

Unit – II

Basics of Solar Energy- Solar Thermal Energy- Solar Photovoltaic- Advantages and Disadvantages-Environmental impacts and safety. Power and energy from wind turbines- India's wind energy potential- Types of wind turbines- Off shore Wind energy- Environmental benefits and impacts.

Unit – III

Biomass resources-Biomass conversion Technologies- Feedstock preprocessing and treatment methods- Bioenergy program in India-Environmental benefits and impacts. Geothermal Energy resources –Ocean Thermal Energy Conversion – Tidal.

Unit – IV

Air pollution- Sources, effects, control, air quality standards, air pollution act, air pollution measurement. Water pollution-Sources and impacts, Soil pollution-Sources and impacts, disposal of solid waste.

Unit – V

Greenhouse gases – effect, acid rain. Noise pollution. Pollution aspects of various power plants. Fossil fuels and impacts, Industrial and transport emissions- impacts.

Text Books

1. Boyle, G. 2004. Renewable energy: Power for a sustainable future. Oxford University press
2. B H Khan, Non Conventional Energy Resources-The McGraw –Hill Second edition.
3. G. D. Rai, Non conventional energy sources, Khanna Publishers, New Delhi, 2006.
4. Gilbert M. Masters, Introduction to Environmental Engineering and Science, 2nd Edition, Prentice Hall, 2003.

References Books

1. Unleashing the Potential of Renewable Energy in India –World bank report.
2. Godfrey Boyle, Bob Everett and Janet Ramage, "Energy Systems and Sustainability. Power for a sustainable future", Oxford University press, 2010

MP101 Engineering Graphics

1-0-4-3

Objectives

- To possess efficient drafting skill
- To provide neat structure of industrial drawing

Outcome

- Ability to perceive/visualize the engineering components

Fundamentals Drawing standard - BIS, dimensioning, lettering, type of lines, scaling-conventions.

Geometrical constructions - dividing a given straight line into any number of equal parts, bisecting a given angle, drawing a regular polygon given one side, special methods of constructing a pentagon and hexagon – conic sections – ellipse – parabola – hyperbola - cycloid – trochoid.

Orthographic projection Introduction to orthographic projection, drawing orthographic views of objects from their isometric views - Orthographic projections of points lying in four quadrants, Orthographic projection of lines parallel and inclined to one or both planes Orthographic projection of planes inclined to one or both planes. Projections of simple solids - axis perpendicular to HP, axis perpendicular to VP and axis inclined to one or both planes.

Sectioning of solids - Section planes perpendicular to one plane and parallel or inclined to other plane. Intersection of surfaces Intersection of cylinder & cylinder, intersection of cylinder & cone, and intersection of prisms. Development of surfaces - Development of prisms, pyramids and cylindrical & conical surfaces.

Isometric and perspective projection Isometric projection and isometric views of different planes and simple solids, introduction to perspective projection. Computer aided drafting Introduction to computer aided drafting package to make 2-D drawings.

Text Books

1. Bhatt, N. D. and Panchal, V.M., Engineering Drawing, Pub.: Charotar Publishing House, 2010
2. Natarajan, K. V., A text book of Engineering Graphics, Pub.: Dhanalakshmi Publishers, Chennai, 2006.

Reference Books

1. Venugopal, K. and Prabhu Raja, V., Engineering Drawing and Graphics + AutoCAD, Pub.: New Age International, 2009.
2. Jolhe, D. A., Engineering drawing, Pub.: Tata McGraw Hill, 2008
3. Shah, M. B. and Rana, B. C., Engineering Drawing, Pub.: Pearson Education, 2009.
4. Trymbaka Murthy, S., Computer Aided Engineering Drawing, Pub.: I.K. International Publishing House, 2009.

SECOND SEMESTER

HM 102 Professional Communications

3-0-0-3

Objectives

- To develop in the under-graduate students of engineering a level of competence in English required for independent and effective communication for their professional needs.

Outcomes

- Ability to apply English in professional Environment
- Ability to communicate themselves effectively in their chosen profession

Unit – I

Listening: Barriers to listening: Physical & psychological – Steps to overcome them – Purposive listening practice – Active listening and anticipating the speaker – Use of technology in the professional world.

Unit _ II

Speaking Fluency & accuracy in speech – Positive thinking – Kinds of thinking - Improving self expression – Tonal variations – Listener oriented speaking -Group discussion practice – Interpersonal Conversation -Developing persuasive speaking skills.

Unit – III

Reading Speed reading practice – Use of extensive readers –Trans-coding: verbal and non- verbal – Eye-reading practice – Analytical and critical reading practice- Introduction to ethics & values through case-study materials.

Unit – IV

Writing Professional Correspondence – Formal and informal letters – Argument Writing practice – Perspectives in writing – Narrative writing -Different registers - Tone in formal writing – Summary writing practice- Introduction to reports.

Unit – V

Study Skills Reference Skills - Use of dictionary, thesaurus etc – Importance of contents page, cover & back pages – Bibliography.

Reference Books

1. Shirley Taylor, "Communication for Business", Longman, New Delhi, 1999
2. Robert Gannon, Best Science Writing: Readings and Insights, University Press, Hyderabad, 2000
3. Richard A. Boning, Multiple Reading Skills, McGraw Hill, Singapore, 1990
4. Albert J. Harris and Edward R. Sipay, How to Increase Reading Ability, Longman, 1990
5. David Martin, "Tough Talking", University press, Hyderabad, 1994

MA102 Mathematics II

3-0-0-3

Objective

- To learn mathematical concepts and methods

Outcome

- Ability to solve industrially applicable problems

Unit – I

Vector space – Subspaces – Linear dependence and independence – Spanning of a subspace – Basis and Dimension. Inner product – Inner product spaces – Orthogonal and orthonormal basis – Gram- Schmidt orthogonalization process.

Unit – II

Basic review of first order differential equation - Higher order linear differential equations with constant coefficients – Equation reducible to linear equations with constant coefficients Simultaneous linear equations with constant coefficients – Method of variation of parameters – Applications – Electric circuit problems.

Unit – III

Gradient, Divergence and Curl – Directional Derivative – Tangent Plane and normal to surfaces – Angle between surfaces –Solenoidal and irrotational fields – Line, surface and volume integrals – Green's Theorem, Stokes' Theorem and Gauss Divergence Theorem (all without proof) – Verification and applications of these theorems.

Unit – IV

Analytic functions – Cauchy – Riemann equations (Cartesian and polar) – Properties of analytic functions – Construction of analytic functions given real or imaginary part - Conformal mapping of standard elementary and bilinear transformation.

Unit – V

Cauchy's integral theorem, Cauchy's integral formula and for derivatives– Taylor's and Laurent's expansions (without proof) – Singularities – Residues – Cauchy's residue theorem – Contour integration involving unit circle.

Text Books

1. Kreyszig, E., Advanced Engineering Mathematics, 9th edition, John Wiley Sons, 2006
2. Grewal, B.S., Higher Engineering Mathematics, 42ndedition, Khanna Publications, Delhi, 2012.

3. Hsiung, C.Y. and Mao, G. Y. Linear Algebra, World Scientific Pub Co Inc., 1999.

Reference Books

1. Apostol, T.M. Calculus, Volume I & II, 2ndEdition, John Wiley & Sons (Asia), 2005
2. Greenberg, M.D. Advanced Engineering Mathematics, 2ndEdition, Pearson Education Inc. (First Indian reprint), 2002
3. Strauss. M.J, Bradley, G.L. and Smith, K.J. Calculus, 3rdEdition, Prentice Hall, 2002
4. Venkataraman, M. K. Linear Algebra, The National Publishing Co, 1999

PH102A Physics II

(Circuit Branches)

3-0-3-4

Objectives

- To make a bridge between the physics in school and engineering courses.
- To introduce the basic concepts of modern physics like fundamentals of quantum mechanics, nuclear physics and advanced materials
- To introduce fundamental physics like electrodynamics and semiconductor physics for circuit branch students.

Outcome

- Ability to understand the fundamentals of electrodynamics and semiconductor physics

Unit – I

Quantum Mechanics

Inadequacy of classical mechanics (black body radiation, photoelectric effect) – wave and particle duality of radiation – de Broglie concept of matter waves – electron diffraction – Heisenberg's uncertainty principle – Schrodinger's wave equation – eigenvalues and eigenfunctions – superposition principle – interpretation of wave function – particle confined in one dimensional infinite square well potential.

Unit - II

Nuclear and Particle Physics

Nuclear properties and forces - Nuclear models - Shell model - Nuclear reaction - Radioactivity - types and half lives - application in determining the age of rock and fossils- Stellar nucleosynthesis. Fundamental forces - Particle physics - classification of matter - quark model - neutrino properties and their detection.

Unit – III

Advanced Materials

Nanomaterials: introduction and properties – synthesis – chemical vapour deposition – ball milling – applications. Carbon nanotubes: structure and properties – synthesis– arc method – pulsed laser deposition- applications. Liquid Crystals: types – nematic, cholesteric, smectic – modes: dynamic scattering, twisted nematic – display systems. Shape memory alloys-one way and two way memory effect- pseudoelasticity-applications.

Unit – IV

Electrodynamics

Electrostatics: Coulomb's law - Gauss's law – proof of Gauss's law- Electrostatic filed in matter: dielectric polarization, polarizability and susceptibility - types of polarization – internal field and Claussius-Mosotti equation. Magetostatics: Lorentz force - Steady current and equation of continuity - Biot-Savart law – Ampere's law –Magnetostatic field in matter: torques and forces on magnetic dipoles-Magnetization-Faraday's law of induction – Maxwell's equations: generalization of Ampere's law — propagation of EM waves in free space.

Unit – V

Semiconductor Physics

Introduction-Direct and indirect band gap semiconductors - Intrinsic semiconductor at 0 K- Intrinsic semiconductor at room temperature-Intrinsic carriers- Electron and Hole concentrations-doping-n-type – p-type-temperature variation of carrier concentration in extrinsic semiconductor-Extrinsic conductivity-Law of Mass action-Charge neutrality-Fermi level in extrinsic semiconductors-Electrical conduction in extrinsic semiconductors- Hall effect.

Text Books

1. M. N. Avadhanulu and P.G. Kshirsagar, "A text book of Engineering Physics", S. Chand and Company, New Delhi, 2009.
2. R. K. Gaur and S. L. Gupta, "Engineering Physics", Dhanpat Rai Publications (P) Ltd., 8th ed., New Delhi, 2001

Reference Books

1. Arthur Beiser, "Concepts of Modern Physics", Tata McGraw-Hill, New Delhi 2010
2. Donald A. Neamen, "Semiconductor Physics and Devices: Basic principle", 4th ed,, McGraw- Hill, New York, 2012
3. David J. Griffiths, "Introduction to Electrodynamics", 3rd ed, Printice Hall of India, New Delhi, 2012
4. Introduction to Nanotechnology, C.P. Poole and F.J. Owens, Wiley, New Delhi (2007)
5. Peter J. Collings, "Introduction to Liquid Crystals Chemistry and Physics", 2nd ed, Princeton University Press, New Jersey, (2002).
6. D. C. Lagoudas, "Shape memory alloys-modeling and engineering applications", Springer, New York, 2008

CH 102A Chemistry II

(for CSE, ECE, EEE, and ICE)

3-0-3-4

Objective

- To understand the basic principles of electrochemistry, cell construction and evaluation, and electrochemical power sources

Outcome

- Ability to comprehend electrochemistry, solids, their properties and applications, and the polymer materials

Unit – I

Electrochemistry- Conductivity of electrolytes- Specific, molar and equivalent conductivity, Nernst equation for electrode potential, EMF series, hydrogen electrode, calomel electrode, glass electrode, Electrolytic and galvanic cells, cell EMF, its measurement and applications, Weston standard cell, reversible and irreversible cells, concentration cell, electrode (hydrogen gas electrode) and electrolyte concentration cell, concentration cell with and without transference

Unit – II

Corrosion - Dry corrosion and wet corrosion, mechanisms, types of corrosion, DMC, DAC, stress, inter granular, atmospheric and soil corrosion, Passivity, Polarization, over potential and its significance, Factors affecting corrosion, protection from corrosion by metallic coatings, electroplating, electroless plating and cathodic protection, Chemical conversion coatings and organic coatings- Paints, enamels

Unit – III

Batteries Different types of batteries-Primary, Secondary & Flow battery and Fuel cell. Working principle and uses-Laclanche cell, Alkaline battery, nicad battery, lithium battery & Mercury battery. Fuel cell- Theory, working and application. Different types of fuel cells- H2/O2, propane-oxygen, PEFC and SOFC. Lead Acid storage cell-charging & discharging principle, operation and uses. Solar battery- its working principle

Unit – IV

Solid State - Types of solids - close packing of atoms and ions - bcc , fcc structures of rock salt – cesium chloride- spinel - normal and inverse spinels, Stoichiometric Defect, controlled valency & Chalcogen semiconductors, Non-elemental semiconducting Materials, Preparation of Semiconductors-steps followed during the preparation of highly pure materials and further treatments. Semiconductor Devices-p-n junction diode

Unit – V

Polymer - Nomenclature, functionality, classification, methods of polymerization, mechanism of polymerization, molecular weight determination - Viscometry, light scattering methods. Plastics-Moulding constituents of a plastics and moulding of plastics into articles. Important thermoplastics and thermosetting resins- synthesis

& applications of PVA, FLUON, PC, Kevlar, ABS polymer, phenolic & amino resins, epoxy resins and polyurethanes, Conductive polymers

Text Books

1. P. C. Jain and M. Jain, Engineering Chemistry, Dhanpat Rai Publishing Company, New Delhi, 2005
2. B. R. Puri, L. R. Sharma, and M.S. Pathania, "Principles of Physical Chemistry", Vishal Publishing Company, 2008.
3. J. D. Lee, "Concise Inorganic Chemistry", 5th Edn., Chapman and Hall, London, 1996.

Reference Books

1. S. S. Dara and S. S. Umare, "A Text Book of Engineering Chemistry", S. Chand Publishing, 2011
2. F.W. Billmayer, "Textbook of Polymer Science", 3rd Edn, Wiley. N.Y. 1991.
3. A. R. West, "Basic Solid State Chemistry", 2nd edition, John Wiley and Sons, 1999.

BE I 102 Basic Civil Engineering

(for Chemical, CSE, ECE, EEE, ICE, Mechanical, MME, and Production)

2-0-0-2

Objectives

- To give an overview of the fundamentals of the Civil Engineering fields to the students of all branches of Engineering
- To realize the importance of the Civil Engineering Profession in fulfilling societal needs

Outcome

- Ability to gain knowledge on on-site selection, construction materials, components of buildings, roads and water resources

Unit – I

Properties and uses of construction materials - stones, bricks, cement, concrete and steel.

Unit – II

Site selection for buildings - Component of building - Foundation- Shallow and deep foundations - Brick and stone masonry - Plastering - Lintels, beams and columns - Roofs.

Unit – III

Roads-Classification of Rural and urban Roads- Pavement Materials-Traffic signs and road marking-Traffic Signals.

Unit – IV

Surveying -Classification-Chain Survey-Ranging-Compass Survey-exhibition of different survey equipment.

Unit – V

Sources of Water - Dams- Water Supply-Quality of Water-Wastewater Treatment – Sea Water Intrusion – Recharge of Ground Water

Reference Books

1. Punmia, B.C, Ashok Kumar Jain, Arun Kumar Jain, Basic Civil Engineering, Lakshmi Publishers, 2012
2. Satheesh Gopi, “Basic Civil Engineering”, Pearson Publishers, 2009.
3. Rangwala, S. C, “Building materials”, Charotar Publishing House, Pvt. Limited, Edition 27,2009
4. Palanichamy, M. S, “Basic Civil Engineering”, Tata Mc Graw Hill, 2000.
5. Lecture notes prepared by Department of Civil Engineering, NITT.

BE II 102 Basic Mechanical Engineering
(for Civil, CSE, ECE, EEE, ICE)

2-0-0-2

Objectives

- To explain the importance of concepts of mechanical engineering and conservation equations
- To introduce the techniques for analyzing the forces, momentum and power.
- To introduce the various properties of materials, and the techniques of selection of materials
- To identify the basic elements of a mechanical system and write their constitutive equations and performance analysis techniques.

Outcomes

- Ability to identify, appreciate and analyze the problems by applying the fundamentals of mechanical engineering
- Ability to develop mechanical systems

Unit – I

Fundamentals Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering, and manufacturing technology.

Unit – II

Thermal Engineering Laws of thermodynamics, types of systems, concepts and types of IC engine, air compressors, principle of turbomachines, properties of steam and steam generators, automobile engineering, introduction to gas turbines and refrigeration & air- conditioning.

Unit – III

Engineering Materials Types of materials, selection of materials, material properties, introduction to materials structure, machine elements, transmission, fasteners, and
support systems.

Unit – IV

Manufacturing Technology Manufacturing, classification, lathe, drilling machines, milling machines, metal joining, metal forming, casting, forging, and introduction to powder metallurgy.

Reference Books

1. Lecture notes prepared by Department of Mechanical Engineering, NITT.
2. K. Venugopal, Basic mechanical Engineering

BS 102 Branch Specific Course in CSE

2-0-0-2

Objectives

- To make the student understand the basic building blocks of a computing system
- To make the student understand the flow of Concept-Program-Input-Processing-Output
- To introduce low level language, translators, operating system

Outcomes

- Ability to trace the Concept-Program-Input-Processing-Output
- Ability to generate low level code for simple programs
- Ability to design simple arithmetic and memory units

Unit – I Concept-Program-Input-Processing-Output

Demo of simple high level language program to low level machine level language program tracing their execution from high level to circuit level/ gate level - Overview of the Hardware Description Language (HDL) - Designing a set of elementary logic gates from primitive NAND gates.

Design of binary adders, culminating in the construction of a simple ALU (Arithmetic-Logic Unit) using logic gates - Design of memory hierarchy from elementary flip-flop gates to registers and RAM units of arbitrary sizes using logic gates

Unit – II Introduction to Low level language

Introducing an instruction set, in both binary and assembly (symbolic) versions; Writing some low-level assembly programs - Other details of computer architecture - Basic language translation techniques: parsing, symbol table, macro-assembly

Unit – III Introduction to Virtual Machine

The role of virtual machines in modern software architectures like Java and .NET; Introduction of a typical VM language, focusing on stack-based arithmetic, logical, and memory access operations - VM abstraction and implementation, focusing on stack-based flow-of-control and subroutine call-and-return techniques

Unit – IV Introduction to Compilers

Context-free grammars and recursive parsing algorithms; Building a syntax analyzer (tokenizer and parser) The syntax analyzer to generate XML code reflecting the structure of the translated program - Code generation, low-level handling of arrays and objects

Unit – V Introduction to OS

Discussion of OS/hardware and OS/software design trade-offs, and time/space efficiency considerations - Design and implementation of some classical arithmetic and geometric algorithms for the implementation of OS - memory management, string processing, and I/O handling algorithms

Text Book

- Noam Nisan, Shimon Schocken, “The Elements of Computing Systems: Building a Modern Computer from First Principles”, The MIT Press, 2005

THIRD SEMESTER

CS201 Data Structures and Algorithms

3-0-0-3

Objectives

- To introduce first level topics covering basics in Algorithms and Data Structures
- To provide examples for various design paradigms
- To expose different problem categories

Outcomes

- Ability to comprehend the basics in algorithms and data structures
- Ability to solve problems that involve these concepts/similar problems
- Ability to provide algorithmic solutions/approaches to new problems

Unit – I

Mathematical preliminaries, time complexity and space complexity, worst-case and average-case analyses, use of order notations and related results, divide and conquer recurrences, recurrence relations: substitution method, recurrence trees, Master's theorem and its applications.

Unit – II

QuickSort and its analyses, MergeSort recurrence, Strassen's matrix multiplication, fast multiplication of large integers, binary search trees, priority queues, Heaps and HeapSort

Unit – III

Data structures for disjoint sets, Path compression, union by rank, Prim's and Kruskal's algorithms, Huffman coding, LZW coding, shortest paths, greedy activity selection, set cover and greedy heuristics.

Unit – IV

Dynamic Programming basics, matrix chain multiplication, DP solution for traveling salesman and 0/1 Knapsack problems, least common subsequences, independent sets and backtracking algorithm, Breadth/depth-first algorithms.

Unit – V

Topological sort, recursive graph algorithms, string matching: KMP algorithm, Rabin-Karp algorithm, number theory algorithms: basics, GCD and extended Eucledean algorithm, primality testing.

Textbook

- T. Cormen, C. Lieserson, R. Rivest, and C. Stein, "Introductions to Algorithms", Prentice-Hall/India, 3rd edition, 2009

CS203 Discrete Structures

Credit: 3

Objectives

- To get familiar and understand the fundamental notions in discrete mathematics
- To understand and demonstrate the basic concept of an algorithm and its application in combinatorial mathematics
- To identify the basic properties of graphs and trees and model simple applications

Outcomes

- Ability to distinguish between the notion of discrete and continuous mathematical structures
- Ability to construct and interpret finite state diagrams and DFSA
- Application of induction and other proof techniques towards problem solving

Unit – I

Set Theory And Logic- Sets, Functions, Relations, Equivalence Relation,Poset. Functions Logic: Propositional Logic, Truth Tables, Tautologies, Resolution Proof System, Predicate Logic.

Unit – II

Induction And Combinatorics - Peano's Axioms - Mathematical Induction - Pigeon-Hole Principle - Principle Of Inclusion And Exclusion - Review Of Permutations And Combinations - Distribution Problems - Derangements - Bijection Principle.

Unit – III

Algebraic Structures - Semi-Groups, Monoids, Groups, Subgroups And Their Properties - Cyclic Groups - Cosets - Permutation Groups - Lagrange's Theorem - Cayley's Theorem - Normal Subgroups - Homomorphism Of Groups - Quotient Groups –Introduction To Rings And Fields.

Unit – IV

Linear Algebra And Recurrence Relations - Linear Algebra: Vector Space, Basis, Dimension, Orthogonality. **Recurrence Relations :** Homogeneous And Inhomogeneous Recurrences And Their Solutions - Solving Recurrences Using Generating Functions.

Unit – V

Graph Theory - Definitions And Basic Results - Representation Of A Graph By A Matrix And Adjacency List - Trees - Cycles - Properties - Paths And Connectedness - Subgraphs - Graph Isomorphism - Operations On Graphs - Vertex And Edge Cuts - Vertex And Edge Connectivity.

Text Books

1. C.L.Liu And D.P.Mohapatra, " Elements Of Discrete Mathematics: A Computer Oriented Approach", Mcgraw Hill, Third Edition, 2012.
2. Kenneth H. Rosen, "Discrete Mathematics And Its Applications" Mcgraw Hill, Seventh Edition, 2012 (Indian Adaptation By Kamala Krithivasan, Iit Madras).

Reference Books

1. R. Balakrishnan and K. Ranganathan, "A Text Book Of Graph Theory", Springer.
2. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier, 2009.
3. Gary Haggard, John Schlipf, and Sue Whitesides, “Discrete Mathematics for Computer Science”, Cengage Learning Publisher, 2005.
1. B. Bollobás, “Modern Graph Theory”, Springer, New York 1998

CS205 Digital Systems Design

3-0-0-3

Objectives

- To understand the essential knowledge on the fundamentals and applications of digital circuits and digital computing principles
- To understand the overview on the design principles of digital computing systems

Outcome

- Ability to design and implement complicated digital systems using Verilog

Unit I

Binary codes **-** Weighted and non-weighted - Binary arithmetic conversion algorithms, Canonical and standard boolean expressions - Truth tables, K-map reduction - Don't care conditions - Adders / Subtractors - Carry look-ahead adder - Code conversion algorithms - Design of code converters - Equivalence functions.

Unit II

Binary/Decimal Parallel Adder/Subtractor for signed numbers - Magnitude comparator - Decoders / Encoders - Multiplexers / Demultiplexers - Boolean function implementation using multiplexers.

Unit III

Sequential logic - Basic latch - Flip-flops (SR, D, JK, T and Master-Slave) - Triggering of flip-flops - Counters - Design procedure - Ripple counters - BCD and Binary - Synchronous counters, Registers - Shift registers - Registers with parallel load, Reduction of state and flow tables - Race-free state assignment - Hazards.

Unit IV

Introduction to VLSI design - Basic gate design - Digital VLSI design - Design of general boolean circuits using CMOS gates. Verilog Concepts – Basic concepts – Modules & ports & Functions – useful modeling techniques – Timing and delays – user defined primitives. Modeling Techniques

Unit V

Advanced Verilog Concepts – Synthesis concepts – Inferring latches and flip-flops – Modeling techniques for efficient circuit design. Design of high-speed arithmetic circuits – Parallelism Pipelined Wallace tree tipliers - Systolic algorithms - Systolic matrix multiplication.

Text Books

1. Morris Mano and Michael D. Ciletti, "Digital Design", 5th edition, Prentice Hall of India, 2012
2. Samir Palnitkar, "Verilog HDL", 2nd Edition, Pearson Education, 2003

Reference Books

1. Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL, 2nd Edition, Pearson Education, 2010
2. Stephen Brown, "Fundamentals of Digital Logic with Verilog", McGraw Hill, 2007

CS207 Data Communication

3-0-0-3

Objectives

- To understand the fundamental concepts of encoding techniques
- To familiarize with various multiplexing techniques
- To understand the importance of error correcting codes in data transmission

Outcomes

- Ability to design and implement error correction and detection codes for correct transmission of data
- Ability to apply data communication concepts in practical areas

Unit – I Introduction to Waveform Encoding

Pulse Code Modulation: Sampling, Quantization, Transmission, Reception, Error, SNR, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, Sigma Delta Modulation, Linear Predictive Coder (LPC)

Unit – II Physical Layer

Digital and Analog Signals, Periodic Analog Signals, Signal Transmission, Limitations of Data Rate, Digital Data Transmission, Performance Measures, Line Coding, Digital Modulation, Media and Digital Transmission System

Unit – III Multiplexing

Multiplexing Techniques: FDM, TDM, STDM, Transmission Media: Classification and Selection of Media, Switching Networks: Packet, Circuit, Massage, Telephone Networks: Packet and Circuit Switching in telephone network

Unit – IV Error Detection and Correction

Types of Errors, Two dimensional parity check, Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes, Checksum, Standardized Polynomial Code, Error Correction Methods, Forward Error Correction

Unit – V Case Study

Wireless Data Transfer, Remote Weather Monitoring System, Energy Management in Wireless System, Emission Monitoring System, Railway Information and Surveillance System, Central Distribution Hub

Reference Books

1. Behrouz A. Forouzan, Sophia Chung Fegan, "Data Communications and Networking", 5th edition, Science Engineering & Math Publications, 2012
2. William Stallings, "Data and Computer Communications", 8th edition, Pearson Education India, 2007

CS209 Computer Organization

3-0-0-3

Objectives

- To understand the basic hardware and software issues of computer organization
- To understand the representation of data at machine level
- To understand how computations are performed at machine level

Outcomes

- Ability to analyze the abstraction of various components of a computer
- Ability to analyze the hardware and software issues and the interfacing
- Ability to work out the tradeoffs involved in designing a modern computer system

Unit – I

Introduction, Technologies for building Processors and Memory, Performance, The Power Wall, Operations of the Computer Hardware, Operands Signed and Unsigned numbers, Representing Instructions, Logical Operations, Instructions for Making Decisions

Unit – II

MIPS Addressing for 32-Bit Immediates and Addresses, Parallelism and Instructions: Synchronization, Translating and Starting a Program, Addition and Subtraction, Multiplication, Division, Floating Point, Parallelism and Computer Arithmetic: Subword Parallelissm, Streaming SIMD Extensions and Advanced Vector Extensions in x86.

Unit – III

Logic Design Conventions, Building a Datapath, A Simple Implementation Scheme, overview of Pipelining, Pipelined Datapath, Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions, The ARM Cortex – A8 and Intel Core i7 Pipelines, Instruction –Level Parallelism and Matrix Multiply Hardware Design language

Unit – IV

Memory Technologies, Basics of Caches, Measuring and Improving Cache Performance, dependable memory hierarchy, Virtual Machines, Virtual Memory, Using FSM to Control a Simple Cache, Parallelism and Memory Hierarchy: Redundant Arrays of Inexpensive Disks, Advanced Material: Implementing Cache Controllers

Unit – V

Disk Storage and Dependability, RAID levels, performance of storage systems, Introduction to multi threading clusters, message passing multiprocessors.

Text Book

1. David A. Patterson and John L. Hennessey, "Computer organization and design, The Hardware/Software interface", Morgan Kauffman / Elsevier, Fifth edition, 2014

Reference Book

1. V. Carl Hamacher, Zvonko G. Varanesic, and Safat G. Zaky, "Computer Organization", 6th edition, McGraw-Hill Inc, 2012
2. William Stallings, "Computer Organization and Architecture", 8th Edition, Pearson Education, 2010

HM201 Corporate Communication

3-0-0-3

Objectives

- To help in participation in seminars, group discussions, and interviews successfully
- To prepare to present ideas effectively to different levels of people
- To enable write reports, research papers, and proposals

Outcomes

- Ability to express themselves meaningfully in seminars and GD
- Ability to write reports, notices, etc., required in the corporate world
- Ability to listen and comprehend and also retain information presented by others

Unit – I: Importance of Communication in the Corporate World

Corporate culture & communication – Networks & channels of communication – Barriers to communication – Strategies to overcome them - Role of psychology in communication- Internal & External Communication- Management & Communication - Institute & Corporate Social Responsibility

Unit – II: Fluent Oral Communication Techniques

Speech mechanics – Mental process of speaking – Extempore speech practice – Body Language – Interview strategies - Seminar & Presentation skills - Use of Visual Aids – Use of Power point- - Techniques to make people listen.

Unit – III: Listening Skills

Importance of listening in the corporate world -Listening for information and content – Kinds of listening – Factors affecting this – Methods to overcome them – Retention of facts, data & figures- Role of Speaker in listening.

Unit – IV: Writing for Technical Purposes

Reader-writer relationship - Varieties of styles and registers- Mechanics of technical writing – Corporate & Institute Branding - website - Communication in Crises – Executive summary and abstract –Memos -- Use of charts, graphs etc.

Unit – V: Writing for Business Purposes

Inter office memos - Circulars and notices – Proposals, Agenda and Minutes – Marketing language –Corporate Branding - 'You' tone - Captions & Eye catchers-- Communication in a crisis.

Reference Books

1. David Lindsay, "Scientific Writing = Thinking in Words", 2011
2. Paul A. Argenti, "Corporate Communication", McGraw Hill, 2008.
3. Sandra M. Oliver, "Handbook of Corporate Communication And Public Relations", Routledge, 2004.

   David Lindsay, "A Guide to Scientific Writing" Macmillan, 1995

CS213 Data Structures Laboratory

0-0-2-2

Objectives

- To analyze the time and space complexities and efficiency of various algorithms.
- To understand the practical application of linear and nonlinear data structures.
- To introduce and practice advanced algorithms, programming techniques necessary for developing sophisticated computer applic ation programs.

Outcomes

- Ability to apply and implement the learned algorithm for problem solving
- Ability to identify the data structure to develop program for real time applications

Experiments

- Problems in C/C++/ Java using data structures involving arrays, stacks, queues, strings, linked lists, trees, graphs.
- Operations on stacks, queues and linked lists
- Conversion of infix expressions to postfix and evaluation of postfix expressions
- Implementation of priority queue
- Implementation of Binary Tree and Binary Search Tree
- Implementation of Sorting Techniques

CS215 Digital System Design Laboratory

0-0-2-2

Objectives

- To develop programs in Hardware Description Language
- To design and implement synchronous sequential, asynchronous sequential circuits
- To be familiar with basic combinational and sequential components used in the typical data path designs

Outcomes

- Ability to design synchronous sequential circuits using basic flip-flops, counters, PLA, PAL
- Familiarize with the necessary software skills to design basic digital systems
- Technical expertise in debugging the digital circuits

Experiments

- Design of a 32-bit carry look-ahead adder with logarithmic depth using Verilog
- Design of a Wallace tree multiplier using Verilog
- Design of a 4-bit DSP processor using Verilog
- Burning the 4-bit DSP processor on a FPGA

FOURTH SEMESTER

CS202 Operating Systems

3-0-0-3

Objectives

- To provide knowledge about the services rendered by operating systems
- To provide a detailed discussion of the various memory management techniques
- To discuss the various file-system design and implementation issues
- To discuss how the protection domains help to achieve security in a system

Outcomes

- Ability to comprehend the techniques used to implement the process manager
- Ability to comprehend virtual memory abstractions in operating systems
- Ability to design and develop file system interfaces, etc.
- Technical knowhow of the working principle of various types of operating systems

Unit – I

Operating Systems –Definition- Types- Functions -Abstract view of OS- System Structures – System Calls- Virtual Machines –Process Concepts –Threads –Multithreading

Unit – II

Process Scheduling- Process Co-ordination –Synchronization –Semaphores –Monitors Hardware Synchronization –Deadlocks –Methods for Handling Deadlocks

Unit – III

Memory Management Strategies –Contiguous and Non-Contiguous allocation –Virtual memory Management –Demand Paging- Page Placement and Replacement Policies

Unit – IV

File System –Basic concepts - File System design and Implementation –Case Study: Linux File Systems - Mass Storage Structure –Disk Scheduling –Disk Management –I/O Systems- System Protection and Security.

Unit – V

Distributed Systems –Distributed operating systems –Distributed file systems –Distributed Synchronization.

Text Book

- Silberschatz, Galvin, Gagne, "Operating System Concepts", John Wiley and Sons, 9th edition, 2013

References Books

1. William Stallings, “Operating Systems –Internals and Design Principles”, 8/E, Pearson Publications, 2014
2. Andrew S. Tanenbaum, “Modern Operating Systems”, 4/E, Pearson Publications, 2014

MA204 Introduction to Probability Theory

3-1-0-4

Objectives

- To introduce the fundamental concepts and theorems of probability theory
- To apply elements of stochastic processes for problems in real life
- To understand elementary queuing concepts and apply elsewhere in computer science.

Outcomes

- Conceptualize the necessity of randomness concept in practical situation
- Approximate the real problems using stochastic process and deduce results
- Deduce useful results and interpret them based on the analysis of queuing theory

Unit – I

Axioms of probability theory - Probability spaces - Joint and conditional probabilities- Bayes' Theorem- Independent events.

Unit – II

Random Variable and random vectors - Distributions and densities. Independent random variables – Functions of one and two random variables.

Unit – III

Moments and characteristic functions - Inequalities of Chebyshev and Schwartz. Convergence concepts.

Unit – IV

Random processes - Stationarity and ergodicity - Strict sense and wide sense stationary processes - Covariance functions and their properties - Spectral representation - Wiener-Khinchine theorem.

Unit – V

Gaussian processes - Processes with independent increments - Poisson processes - Lowpass and Bandpass noise representations.

Text Books

- Papoulis, A., "Probability, Random variables and Stochastic Processes", 4th edition, McGraw Hill, 2002
- Davenport, "Probability and Random Processes for Scientist and Engineers", McGraw-Hill, 1970

CS206 Computer Networks

3-0-0-3

Objectives

- To provide insight about networks, topologies, and the key concepts
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP
- To know the basic concepts of network security and its various security issues related with each layer

Outcomes

- Obtain insight about basic network theory and layered communication architectures
- Provide solutions to various problems in network theory

Unit – I

Introductory Concepts - Network hardware - Network software – Review of Physical layer - Guided transmission media - Cable television

Unit – II

Data Link Layer - Design issues - Channel allocation problem - Multiple access protocols - Ethernet - Wireless LAN - 802.11 architecture

Unit – III

Network Layer - Design issues - Routing algorithms - Congestion control algorithms - Quality of Service - Internetworking

Unit – IV

Transport Layer - Transport service - Elements of transport protocols - User Datagram Protocol - Transmission Control Protocol

Unit – V

Application Layer - DNS - Electronic mail - World Wide Web - Multimedia

Text Books

1. Andrew S. Tanenbaum and David J. Wetherall, “Computer Networks”, 5th edition, Prentice Hall, 2010
2. W. Stallings, "Data and Computer Communication", 8th Edition, Pearson Education, 2007

Reference Book:

- Behrouz A. Foruzan, “Data Communication and Networking”, 5th edition, Science Engineering & Math Publications, 2012

CS208 Automata and Formal Languages

3-1-0-4

Objectives

- To introduce concepts in automata theory and theory of computation
- To identify different formal language classes and their relationships
- To design grammars and recognizers for different formal languages

Outcomes

- Ability to relate practical problems to languages, automata, and computability
- Ability to demonstrate an increased level of mathematical sophistication
- Ability to apply mathematical and formal techniques for solving problems

Unit – I Introduction

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, Distinguishing one string from other, Myhill-Nerode Theorem

Unit – II Regular Expression (RE)

Regular expression (RE) Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, 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, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit – III Context Free Grammar (CFG) and Context Free Languages (CFL)

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

Unit – IV 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,

Unit – V Turing machines (TM)

Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Chur ch's Thesis, 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 Book

1. Hopcroft and Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education, 3rd edition, 2006

Reference books

1. Martin J. C., “Introduction to Languages and Theory of Computations”, TMH, 4th edition, 2010
2. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Pub. House, 2011
3. Papadimitriou, C. and Lewis, C. L., “Elements of the Theory of Computation”, PHI, 1997

CS210 Advanced Algorithms

3-0-0-3

Objective

- To expose the students to advanced topics in algorithms including use of advanced concepts in data structures and algorithms for manipulations

Outcomes

- Ability to apply hashing techniques, use data structures in new algorithms
- Ability to comprehend complex real world scenarios and map to advanced algorithms understand

Unit – I

Review of algorithmic paradigms, Finding max and min in a list adversary arguments selection in expected liner time, selection in worst case, hashing technique- hash tables, hash functions, open hashing, perfect hashing, related theorems.

Unit – II

Binary search trees, AVL trees, randomly built binary search trees, optimal binary search trees, greedy strategy and matroids, weighted matroids and task scheduling problem, introduction to amortised analysis, illustrative examples

Unit – III

B-Trees, Binomial heaps, data structures for disjoint sets, shortest paths: difference constraints and shortest paths, proofs of shortest path properties, relationship to matrix multiplication, Floyd-Warshall algorithm, Johnson's algorithm for sparse graphs

Unit – IV

Flow networks and their properties, Ford-Fulkerson method, maximum bipartite matching, FFT algorithm, DFT and FFT, efficient FFT implementation, primality testing basics, Miller-Rabin algorithm and its proof

Unit – V

Polynomial time and exponential time algorithms, 3-CNF satisfiability and other representative hard problems, decision and optimization problems, encodings, formal language framework, verification algorithms, classes P and NP, NP-Hard and NP complete problems, efficient reduction proofs via examples

Textbook

- T. Cormen, C. Lieserson, R. Rivest, and C. Stein, "Introductions to Algorithms", Prentice-Hall/India, 3rd edition, 2009

CS212 Combinatorics and Graph Theory

3-0-0-3

Objective

- To introduce basic combinatorics and graph theory

Outcomes

- Ability to apply combinatorial ideas in other mathematical arguments in other subjects e.g., analysis of algorithms, queueing theory, etc.
- Ability to comprehend graph theory fundamentals and tackle problems in dynamic programming, network flows, etc.

Unit – I

Scope of the course, Application areas in CS, A feel of some advanced problems in Combinatorial Optimization/ Graph Theory, Sum/Product rules, Power set - algorithm, Bijections/Mapping/Examples Permutations and combinations, examples, Combinatorial ideas, Pascal Triangle Counting principles via examples, Insertion sort, Stirling numbers

Unit – II

Average case analysis and combinatorial ideas Double counting - Fubini's method, PHP principle, various illustrations Stirling numbers of II kind, Combinatorial identities, Binomial theorem Multinomial theorem, P(n,t1, - - - ,tp) notation, Euler PHI-function, Properties, Steps in Sieve of Eratosthenes

Unit – III

Inclusion/Exclusion Principle, Exercises, Derangements, IMO type problems, Ramsey Theory, Partition problems, Ferrar Diagrams Recurrences - Examples in CS, Substitution methods, Recurrence trees, D&C Solving Fibonacci series - GF idea, Difference equations, examples. Homogeneous case Inhomogeneous case

Unit – IV

Basics of GFs, Review problems, Examples, GF manipulations Coupled difference equations, Graph theory fundamentals, Representations, Examples in CS - MST review, Party problem Distance in graphs, Floyd-Warshall algorithm, Operations in graphs, Meanings of products

Unit – V

Regular graphs, related results, Coloring, Cliques and independent sets, Trees, definitions, related problems, properties, Network Flows, Definitions, Related discussions and Max-Flow Min-Cut Theorem, Introduction to optimization problems in CS, LP formulation, Branch-and-Bound

Text books

1. J. H. Van Lint and R. M. Wilson, “A course in Combinatorics”, 2nd edition, Cambridge Univ. Press, 2001

G. Chartrand and P. Zhang, “Introduction to Graph Theory”, McGraw-Hill, 2006

CS214 Algorithms Laboratory

0-0-2-2

Objectives

- To learn how to analyze the complexity of algorithms
- To compare and evaluate algorithms in terms of time and space complexity
- To program brute force, divide and conquer, decrease and conquer, transform and conquer, greedy, and dynamic techniques

Outcomes

- Ability to solve and analyze general algorithms based on space and time complexity
- Ability to implement and empirically compare fundamental algorithms and data structures to real-world problems
- Knowledge about different algorithmic paradigms and optimization

Experiments

- Estimating worst-case/average-case complexity of algorithms via programs
- Determining machine constants
- Programs involving some advanced data structures
- Implementing example problems
- Illustrating the different paradigms of algorithm design
- Solving miscellaneous problems e.g. problems in string manipulation, graph theory, optimization

CS216 Operating Systems Laboratory

0-0-2-2

Objectives

- To understand the concept of Operating System
- To experience the practical side of the functioning of various blocks in OS

Outcomes

- Ability to make use of tools for solving synchronization problems
- Ability to compare and contrast various CPU scheduling algorithms
- Ability to understand the differences between segmented and paged memories

Experiments

1. Hands on Unix Commands
2. Shell programming for file handling
3. Shell Script programming using the commands *grep, awk* and *sed*
4. Implementation of CPU scheduling algorithms
5. Pthread Programming
6. Implementation of Synchronization problems using Semaphores, Message Queues and Shared Memory
7. Implementation of Memory Management - Allocation, Placement and replacement Algorithms

References

1. Silberschatz, Galvin, Gagne, "Operating System Concepts", 9/E, John Wiley and Sons 2013
2. William Stallings, “Operating Systems –Internals and Design Principles”, 8/E, Pearson Publications, 2014
3. Andrew S. Tanenbaum, “Modern Operating Systems”, 4/E, Pearson Publications, 2014

FIFTH SEMESTER

CS301 Computer Architecture

3-1-0-4

Objectives

- To understand the concept of advanced pipelining techniques
- To understand the current state of art in memory system design
- To know the working principle of I/O devices

Outcomes

- Ability to apply performance metrics to find the performance of systems
- Ability to identify the problems in components of computer
- Ability to comprehend and differentiate various computer architectures and hardware

Unit I

Introduction, Classes of computers, Defining Computer Architecture – Trends in Technology – Trends in Power and Energy in Integrated Circuits – Trends in Cost – Dependability – Measuring, Reporting and Summarizing Performance – Quantitative Principles of Computer Design.

Unit II

Basic and Intermediate pipelining Concepts, The Major Hurdle of Pipelining – Pipeline Hazards, Pipelining Implementation, Implementation issues that makes Pipelining hard, Extending the MIPS Pipeline to Handle Multicycle Operations, The MIPS R4000 Pipeline.

Unit III

Instruction-Level Parallelism: Concepts and Challenges – Basic Compiler Techniques for Exposing ILP – Reducing Branch Costs with Prediction – Overcoming Data Hazards with Dynamic Scheduling – Dynamic Scheduling – Hardware-Based Speculation – Exploiting ILP Using Multiple Issue and Static Scheduling – Exploiting ILP, Advanced Techniques for Instruction Delivery and Speculation, Studies of the Limitations of ILP

Unit IV

Vector Architecture – SIMD Instruction Set Extensions for Multimedia – Graphics Processing Units – Detecting and Enhancing Loop-Level Parallelism – Centralized Shared-Memory Architectures – Performance of Shared-Memory Multiprocessors – Distributed Shared Memory, Models of Memory Consistency, Multicore Processors and Their Performance.

Unit V

Review of Memory Hierarchy Design, Cache Performance, Basic Cache Optimizations, Virtual Memory, Protection and Examples of Virtual Memory, Advanced Optimizations of Cache Performance, Memory Technology and Optimizations, Protection: Virtual Memory and Virtual Machines, Crosscutting Issues: The Design of Memory Hierarchies. Case Studies / Lab Exercises

Text Book

1. David. A. Patterson and John L. Hennessy, "Computer Architecture: A Quantitative approach", Elsevier, 5th Edition, 2012

Reference Book

- K. Hwang and Naresh Jotwani, “Advanced Computer Architecture, Parallelism, Scalability, Programmability”, Tata McGraw Hill, 2nd Edition, 2010

MA304 Principles of Operations Research

3-1-0-4

Objectives

- To classify and formulate real-life problem for modelling, solving and applying for decision making.
- To study the formulation and various methods of solutions for linear programming, transportation, assignment, CPM and PERT problems
- To solve problems using dynamic programming method

Outcomes

- Analyse problems in engineering, management, or business environment, focusing on important details
- Formulate real problems in terms of input-output-parameters relationships and identify the solution procedure

Unit - I

Introduction to operational research-Linear programming problems (LPP)-Graphical method-Simplex method-Big M Method-Dual simplex method-Primal Dual problems.

Unit – II

Dual theory and Sensitivity analysis-Transportation and assignment problems-Applications(Emphasis should be more on problems than theory)

Unit – III

CPM and PERT –Network diagram-Events and activities-Project Planning-Reducing critical events and activities-Critical path calculations-example-Sequencing problems.

Unit – IV

Replacement problems-Capital equipment-Discounting costs-Group replacement. Inventory models-various costs- Deterministic inventory models-Economic lot size-Stochastic inventory models-Single period inventory models with shortage cost.

Unit – V

Dynamic programming-Formulation-Invest problem-General allocation problem-Stage coach problem-Production Scheduling.

Text Books

- H. A. Taha, "Operations Research - An introduction", 9th edition, Prentice Hall, Macmillan, 2010
- F. S. Hiller and G. J. Liebermann, "Introduction to operational research", 8th edition, McGraw-Hil, 2005
- B. E. Gillet, "Introduction to operational research-A computer oriented algorithmic approach", McGraw Hill, 1989
- H. M. Wagner, Principles of operational research with applications to managerial decisions, PH, Inc, 1975

CS303 Internetworking Protocols

3-0-0-3

Objectives

- To know the design principles of internetworking protocols
- To know the implementation details of IPv4, IPv6, and TCP
- To adapt the IP for Mobile applications

Outcomes

- Ability to code and implement MAC protocols, IPv4, IPv6, and TCP
- Ability to design and develop Mobile IP

Unit – I

OSI and TCP/IP Reference model, Concepts of multiplexing and switching, MAC protocols – ALOHA, CSMA/CD, IEEE Standard 802 from Ethernet, Token Bus, and Token Ring, Comparison of 802 Bridges.

Unit - II

IPv4 headers, IP forwarding, Host Processing of IP datagrams, DHCP and Autoconfiguration, Firewalls and NAT, ICMPv4, IP Fragmentation, Broadcasting and Local Multicasting – IGMP and MLD, Routing Protocols

Unit – III

IPv6 Transition issues, Protocol basics, Addressing, Options and Extension headers, ICMPv6, Neighbor Discovery, Routing, Autoconfiguration, IPv6 and DNS

Unit – IV

Introduction to TCP, TCP Header and Encapsulation, TCP Connection Management, TCP Timeout and Retransmission, TCP Data Flow and Window Management, TCP Congestion Control, TCP Timers

Unit - V

Need for Mobile IP, Overview of Mobile IP, Details of Mobile IP, Tunneling, Mobility for IPv6, Applications of Mobile IP – Security primer, Campus Mobility, Internet wide mobility, A service provider perspective

Text Books

1) W. Richard Stevens and G. Gabrani, “TCP/IP Illustrated: The Protocols”, Pearson, 2011
2) Peter Loshin, Morgan Kaufmann, ”IPv6: Theory, Protocol, and Practice”, 2nd Ed, 2003
3) James Solomon, “Mobile IP: The Internet Unplugged”, 1st Ed, Pearson Education, 2008

Reference Books

1) Kevin R. Fall and W. Richard Stevens, “TCP/IP Illustrated, Vol. 1- The Protocols”, 2nd Edition, Addison-Wesley, 2011
2) Silvia Hagen, “IPv6 Essentials, 2nd Edition, O'Reilly Media, 2006
3) Charles E. Perkins, “Mobile IP: Design Principles and Practices”, 1st Edition, Pearson Education, 2008

CS305 Database Management Systems

3-0-0-3

Objectives

- To learn data models, conceptualize and depict a database system using ER diagram
- To understand the internal storage structures in a physical DB design
- To know the fundamental concepts of transaction processing techniques

Outcomes

- Ability to Install, configure, and interact with a relational database management system
- Ability to master the basics of SQL and construct queries using SQL

Unit – I Introduction

Purpose of Database System -– Views of data – data models, database management system, three-schema architecture of DBMS, components of DBMS. E/R Model - Conceptual data modeling - motivation, entities, entity types, attributes, relationships, relationship types, E/R diagram notation, examples.

Unit – II Relational Model

Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators, 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

Unit – III Database Design

Dependencies and Normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, 4NF, and 5NF

Unit – IV Transactions

Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.

Unit – V Implementation Techniques

Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.

Text Books

1. A. Silberschatz, Henry F. Korth, and S. Sudharshan, “Database System Concepts”, 5th Ed, Tata McGraw Hill, 2006.
2. C. J. Date, A. Kannan and S. Swamynathan, “An Introduction to Database Systems”, 8th ed, Pearson Education, 2006.

References Books

1. Ramez Elmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, Fourth Edition, Pearson/Addision wesley, 2007
2. Raghu Ramakrishnan, “Database Management Systems”, Third Edition, McGraw Hill, 2003
3. S. K. Singh, “Database Systems Concepts, Design and Applications”, First Edition, Pearson Education, 2006

CS307 Software Engineering

3-0-0-3

Objectives

- To understand the Software Engineering Practice& Process Models
- To understand Design Engineering, Web applications, and Software Project Management

Outcome

- Ability to enhance the software project management skills

Unit-I

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit-II

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS, Architectural design, component level design, user interface design, WebApp Design.

Unit-III

Quality concepts, Review techniques, Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

Unit –IV

Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing, Software Testing Strategies - Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Testing conventional applications, object oriented applications, and Web applications, Formal modelling and verification, Software configuration management, Product metrics.

Unit-V

Project Management Concepts, Process and Project Metrics, Estimation for Software projects, Project Scheduling, Risk Management, Maintenance and Reengineering.

Text books

1. R. S. Pressman, “Software Engineering: A Practitioners Approach”, McGraw Hill, 7th edition, 2010
2. Rajib Mall, “Fundamentals of Software Engineering”, PHI Publication, 3rd edition, 2009

CS309 Network Programming Laboratory

0-0-2-2

Objectives

- To create client and server applications using the "Sockets" API and the implementation of Data link layer protocol and TCP layer
- To conduct computer communication network simulations
- To have a hands on experience of computer network simulation and modeling techniques using NS-3 simulation software

Outcomes

- Ability to invoke analytical studies of Computer Networks through network simulation
- Technical knowhow of the various components in NS-3 toolkit and its importance in designing a real network

Experiments

1. Exercises on Socket Programming using C and Java
2. Exercises using NS-3 Network Simulator
    a. Basics of Network Simulation
        – Introduction , Platform required to run network simulator, Backend Environment of Network Simulator, Agents and applications, Tracing

    b. Simulating a Local Area Network
        – Local Area Network, LAN Topologies, MAC Protocol, Taking turns, Ethernet, Ethernet Frame Structure, Ethernet Versions, Simulating a LAN using Network Simulator 3
        – Implementation of various MAC protocols
        – Setting up of various network topologies
        – Measurement of routing protocols

    c. Measuring Network Performance
        – Network Performance Evaluation, Performance Evaluation Metrics, Parameters Affecting the Performance of Networks, Performance Evaluation Techniques, Network Performance Evaluation using NS-3
        – Setting up of network that carries various application protocols and analyzing the performances
3. Hands on experiments on Network equipments
    a. Switches, Routers
    b. Hardware firewall

References

1. W. Richard Stevens, "UNIX Network Programming – Networking APIs: Sockets and XTI", Vol. 1, 2nd Ed, 1998, Prentice Hall
2. Eitan Altman and Tania Jimenez, "NS Simulator for Beginners", Morgan & Claypool Publishers, 2011
3. Jack L. Burbank, "An Introduction to Network Simulator 3", 1st edition, Wiley-Blackwell, 2015

CS311 Database Management Systems Laboratory

0-0-2-2

Objectives

- To explore the features of a Database Management Systems
- To interface a database with front end tools
- To understand the internals of a database system

Outcomes

- Ability to use databases for building client server applications
- Gaining knowledge about the internals of a database system

Experiments

- Working with DDL,DML and DCL
- Inbuilt functions in RDBMS.
- Nested Queries & Join Queries.
- Set operators & Views in SQL.
- Control structures.
- Working with Procedures and Functions.
- Triggers
- Dynamic & Embedded SQL
- Working with XML
- Forms & Reports
- Database Design and implementation (Mini Project)

References

1. Abraham Silberschatz, Henry F. Korth, and S. Sudharshan, "Database System Concepts", 6th edition, Tata McGraw Hill, 2011
2. Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", 4th Edition, Pearson/Addision wesley, 2007

SIXTH SEMESTER

CS302 Principles of Cryptography

3-1-0-4

Objectives

- To gain knowledge about the mathematics of the cryptographic algorithms
- To get an insight into the working of different existing cryptographic algorithms
- To learn how to use cryptographic algorithms in security

Outcomes

- Able to understand the basic concepts of symmetric cryptosystem, public key cryptosystem and digital signature scheme
- Able to reason about the security of cryptographic constructions
- Able to break the cryptosystems that are not secure

Unit – I

Number Theory: Fermat's theorem, Cauchy 's theorem, Chinese remainder theorem, Primality testing algorithm, Euclid's algorithm for integers, quadratic residues, Legendre symbol, Jacobi symbol

Unit – II

Cryptography and cryptanalysis, Classical Cryptography, different type of attack: CMA, CPA, CCA etc., Shannon perfect secrecy, OTP, Pseudo random bit generators, stream ciphers and RC4

Unit – III

Block ciphers: Modes of operation, DES and its variants, finite fields (2^n), AES, linear and differential cryptanalysis

Unit – IV

One-way function, trapdoor one-way function, Public key cryptography, RSA cryptosystem, Diffie-Hellman key exchange algorithm, ElGamal Cryptosystem

Unit – V

Cryptographic hash functions, secure hash algorithm, Message authentication, digital signature, RSA digital signature

Text Book

- Stinson. D. Cryptography: Theory and Practice, 3rd edition, Chapman & Hall/CRC, 2012

Reference

1. W. Stallings,"Cryptography and Network Security Principles and practice", 5/e, Pearson Education Asia, 2013
2. Behrouz A. Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", 2nd edition, Tata McGraw Hill, 2013
3. Thomas Koshy, "Elementary Number Theory with Applications", Elsevier India, 2005
4. Online course: course on cryptography by Dan Boneh

CS304 Service Oriented Architecture

3-0-0-3

Objectives

- To provide an overview of XML Technology and modeling databases in XML
- To provide an overview of Service Oriented Architecture and Web services and their importance
- To introduce Security solutions in XML and Web Services and to introduce Security standards for Web Services

Outcomes

- Ability to design and develop real work applications using the concepts of SOA and Web services
- Ability to comprehend approaches for providing security for XML documents as well as messages exchanged among Web Services

UNIT I XML Technology

XML – XML and Web - Name Spaces – XML Document Structure - Structuring with Schemas and DTD - Modeling Databases in XML – XQuery

UNIT II SOA Basics

Service Oriented Architecture (SOA) – Comparing SOA with Client-Server and Distributed architectures - Characteristics of SOA – Benefits of SOA -- Principles of Service orientation – Service layers - Business Process management

UNIT III Web Services (WS)

SOA and Web Services – Web Services Protocol Stack – Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI. Service-Level Interaction patterns – XML and Web Services - Enterprise Service Bus - .NET and J2EE Interoperability.

UNIT IV WS Technologies and Standards

Web Services Technologies - JAX-RPC, JAX-WS. Web Service Standards – WS-RM, WS-Addressing, WS-Policy. Service Orchestration and Choreography – Composition Standards - BPEL. Service Oriented Analysis and Design.

UNIT V XML and WS Security

XML Security Overview – Canonicalization – XML Security Framework – XML Encryption – XML Signature – XKMS Structure. Web Services Security - XACML - WS-Security.

Text Books

1. Ron Schmelzer et al. “XML and Web Services”, Pearson Education, 2008. (Unit 1 and 3)
2. Thomas Erl, “ Service Oriented Architecture: Concepts, Technology, and Design”, Pearson Education, 2005 (Unit 2, 3, 4, and 5)
3. Frank P. Coyle, “XML, Web Services and the Data Revolution”, Pearson Education, 2002 (Unit 5)

Reference Books

1. Eric Newcomer, Greg Lomow, “Understanding SOA with Web Services”, Addison Wesley, 2005.
2. James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, “Java Web Services Architecture”, Elsevier, 2011.
3. Mark O’ Neill, et al., “Web Services Security”, Tata McGraw-Hill Edition, 2003
4. Sandeep Chatterjee and James Webber, “Developing Enterprise Web Services: An Architect's Guide”, Prentice Hall, 2004

CS306 Microprocessors and Microcontrollers

3-0-0-3

Objectives

- To understand the concepts of Architecture of 8086 microprocessor
- To understand the design aspects of I/O and Memory Interfacing circuits
- To understand the architecture and programming of ARM processor

Outcomes

- Ability to design and implement programs on 8086 microprocessor
- Ability to design I/O circuits and Memory Interfacing circuits
- Ability to design and develop components of ARM processor

Unit – I THE 8086 MICROPROCESSOR

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

Unit – II 8086 SYSTEM BUS STRUCTURE

8086 signals – Basic configurations – System bus timing –System design using 8086 – IOprogramming – Introduction to Multiprogramming – System Bus Structure - Multiprocessorconfigurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

Unit – III MICROCONTROLLER

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Programming 8051 Timers – Interfacing Microcontroller **-** Serial Port Programming - Interrupts Programming – LCD & Keyboard - External Memory Interface- Stepper Motor.

Unit – IV INTRODUCTION TO EMBEDDED SYSTEMS

Complex systems and micro processors– Embedded system design process – Instruction sets preliminaries - ARM Processor – CPU: programming input and output supervisormode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance

Unit – V EMBEDDED COMPUTING PLATFORM DESIGN AND OPTIMIZATION

The CPU Bus-Memory devices and systems–Designing with computing platforms – platform-level performance analysis - Components for embedded programs-Models of programs-Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Analysis and optimization of program size- Program validation and testing.

Text Books

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", 2nd Edition, Pearson Education, 2011
3. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", 3rd Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012

References Books

1. Doughlas V. Hall, "Microprocessors and Interfacing, Programming and Hardware", Tata McGraw-Hill, 2012
2. Jonathan W. Valvano, "Embedded Microcomputer Systems Real Time Interfacing", 3rd Edition, Cengage Learning, 2012
3. David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007

CS308 Mobile Applications Development

3-0-0-3

Objectives

- To learn the basics of mobile application development
- To get accustomed to Android platform
- To develop skills in developing basic Android applications

Outcomes

- Ability to design and develop Android applications
- Acquire skill set to execute applications in Android based devices

Unit – I Introduction to Android

Native Android Application; SDK Features; Introduction to Open Handset Alliance; Development Framework; Creating Application: Creating applications, Creating Virtual Device, Running and Debugging Application; Developing for Mobile and Embedded Devices; Android Development Tools

Unit – II User Interfaces and Resource Management

Basic UI Design; Fragments; Widget Toolbox; Creating New View; Adapters; Introduction to Intents; Intent Filters and broadcast Receivers; Device Monitoring Using Broadcast Intents; Downloading and Parsing Internet Resources; Download Manager; Internet Services

Unit – III Files and Database Handling

Saving Application Data; Shared Preferences; Preference Framework and Activity; Static File as Resource; File System; Introduction to SQLite Database; Querying SQLite; Content Provider; Adding Search to Application; Native Android Content Provider

Unit – IV Background Services and User Experience Enhancement

Creating and Controlling Service; Binding Services to Activities; Background Threads; Alarms; Action Bar; Menus and Action Bar Items; Dialogs; Customizing Toast; Notifications; Adding Notification and Dialog to Earthquake Monitor

Unit – V Multimedia, Wireless Connectivity and Telephony

Audio and Video Handling; Manipulating Raw Audio; Sound Effects; Camera Programming; Video Recording; Managing Wireless Connectivity : WiFi, Bluetooth, Near Field Communication; Hardware Support for Telephony; Telephony Management; SMS and MMS

Reference Books

1. Reto Meier, “Professional Android 4 Application Development”, Wrox, 2012
2. Matt Gifford, “PhoneGap Mobile Application Development Cookbook”, PACKT, 2012
3. Adrian Kosmaczewski, “Mobile JavaScript Application Development”, O’RELLY, 2012

CS310 Mobile Applications Development Laboratory

0-0-2-2

Objectives

- To learn the basics of mobile application development
- To get accustomed to Android platform
- To develop skills in developing basic Android applications

Outcomes

- Hands on experience in Android application
- Acquire skill set to execute applications in Android based devices

Experiments

1. Install the Android SDK and developer tools and build a test project to confirm that those tools are properly installed and configured
2. Write a program using a Table Layout for our restaurant data entry form, add a set of radio buttons to represent the type of restaurant
3. Write a program using activity class to show different events.
4. Write a program to send user from one application to another. (For example redirection to map)
5. Write a program to play audio files.
6. Write a program to play video files.
7. Write a program to capture image using built in camera.
8. Write a program to send SMS.
9. Write a program to convert text to speech.
10. Write a program to call a number.

CS312 Microprocessor and Microcontroller Laboratory

0-0-2-2

Objectives

- To understand and learn the assembly language programming of various microprocessor architectures
- To obtain the practical training of interfacing the peripheral devices with the processor.
- To control the components of a microprocessor based system through the use of interrupts.
- To have a practical knowledge on assembling PC hardware, installation and troubleshooting the Microprocessor and Microcontrollers.

Outcomes

- Obtain knowledge to doe programs in assembly language programming using the trainer kits
- Utilize development kits effectively for the real time applications of various peripheral devices with the processor
- Hands on experience in interfacing devices with the microprocessor

Experiments

- Solving problems using 8085
- Interfacing various devices with the microprocessor: A/D converter, D/A converter, seven segment display, stepper motor, external keyboard, interrupt controller and 8251 for serial data transfer
- Interfacing using microcontroller trainer kits
- PC hardware assembly
- Installation and trouble shooting

SEVENTH SEMESTER

CS401 Web Technology

3-0-0-3

Objectives

- To understand the basics of Web Designing using HTML, DHTML, and CSS
- To learn the basics about Client side scripts and Server side scripts

Outcomes

- Ability to design and develop client side scripting techniques
- Ability to build real world applications using client side and server side scripting languages

Unit - I

HTML- List, Tables, Images, Forms, Frames, Cascading Style sheets. XML- Document type definition, XML Schemas, Document Object model

Unit – II

Java Script -Control statements, Functions, Arrays, Objects, Events, Dynamic HTML with Java Script, Ajax

Unit – III

Web servers – IIS (XAMPP, LAMPP) and Tomcat Servers. Java Web Technologies- Servlets, JavaServer Pages, Java Server Faces, Web Technologies in Netbeans, Building a Web Application in Netbeans, JSF Components, Session Tracking, Cookies

Unit – IV

PHP- Basics, String Processing and Regular Expressions, Form Processing and Business Logic, Using Cookies, Dynamic Content, Operator Precedence Chart

Unit – V

Database Connectivity with MySQL - Servlets, JSP, PHP. Case Studies- Student information system, Health Management System

Text books

1. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, “Internet & World Wide Web How to Program”, Deitel series, 5th edition, 2012
2. Jason Gilmore, “Beginning PHP and MySQL From Novice to Professional”, 4th Edition, Apress Publications, 2010

Reference Books

1. Robert W. Sebesta, “Programming with World Wide Web”, Pearson, 4th edition, 2008
2. David William Barron, “The World of Scripting Languages”, Wiley Publications, 2000

CS403 Parallel Architectures and Programming

3-0-0-3

Objectives

- To understand the fundamental principles and engineering trade-offs involved in designing modern parallel computers
- To develop programming skills to effectively implement parallel architecture

Outcomes

- Ability to design parallel programs to enhance machine performance in parallel hardware environment
- Ability to design and implement parallel programs in modern environments such as CUDA, OpenMP, etc.

Unit – I

Introduction: The need for parallelism, Forms of parallelism (SISD, SIMD, MISD, MIMD), Moore's Law and Multi-cores, Fundamentals of Parallel Computers, Communication architecture, Message passing architecture, Data parallel architecture, Dataflow architecture, Systolic architecture, Performance Issues.

Unit – II

Large Cache Design: Shared vs. Private Caches, Centralized vs. Distributed Shared Caches, Snooping-based cache coherence protocol, directory-based cache coherence protocol, Uniform Cache Access, Non-Uniform Cache Access, D-NUCA, S-NUCA, Inclusion, Exclusion, Difference between transaction and transactional memory, STM, HTM.

Unit – III

Graphics Processing Unit: GPUs as Parallel Computers, Architecture of a modern GPU, Evolution of Graphics Pipelines, GPGPUs, Scalable GPUs, Architectural characteristics of Future Systems, Implication of Technology and Architecture for users, Vector addition, Applications of GPU.

Unit – IV

Introduction to Parallel Programming: Strategies, Mechanism, Performance theory, Parallel Programming Patterns: Nesting pattern, Parallel Control Pattern, Parallel Data Management, Map: Scaled Vector, Mandelbrot, Collative: Reduce, Fusing Map and Reduce, Scan, Fusing Map and Scan, Data Recognition: Gather, Scatter, Pack , Stencil and Recurrence, Fork-Join, Pipeline

Unit – V

Parallel Programming Languages: Distributed Memory Programming with MPI: trapezoidal rule in MPI, I/O handling, MPI derived datatype, Collective Communication, Shared Memory Programming with Pthreads: Conditional Variables, read-write locks, Cache handling, Shared memory programming with Open MP: Parallel for directives, scheduling loops, Thread Safety, CUDA: Parallel programming in CUDA C, Thread management, Constant memory and Event, Graphics Interoperability, Atomics, Streams.

Text Books/Reference Books

1. D. E. Culler, J. P. Singh, and A. Gupta, “Parallel Computer Architecture”, Morgan-Kaufmann, 2004
2. Rajeev Balasubramonian, Norman P. Jouppi, and Naveen Muralimanohar, “Multi-Core Cache Hierarchies”, Morgan & Claypool Publishers, 2011
3. Peter and Pach Eco, “An Introduction to Parallel Programming”, Elsevier, 2011
4. James R. Larus and Ravi Rajwar, “Transactional Memory”, Morgan & Claypool Publishers, 2007
5. David B. Kirk, Wen-mei W. Hwu, “Programming Massively Parallel Processors: A Hands-on Approach”, 2010
6. Barbara Chapman, F. Desprez, Gerhard R. Joubert, Alain Lichnewsky, Frans Peters “Parallel Computing: From Multicores and GPU's to Petascale”, 2010
7. Michael McCool, James Reinders, Arch Robison, “Structured Parallel Programming: Patterns for Efficient Computation”, 2012
8. Jason Sanders, Edward Kandrot, “CUDA by Example: An Introduction to General-Purpose GPU Programming”, 2011

CS405 Principles of Compiler Design

3-0-0-3

Objectives

- To introduce the major concept areas of language translation and compiler design
- To enrich the knowledge in various phases of compiler and its use
- To provide practical programming skills necessary for constructing a compiler

Outcomes

- Ability to apply the knowledge of lex tool & yacc tool to develop a scanner & parser
- Ability to design and develop software system for backend of the compiler
- Ability to comprehend and adapt to new tools and technologies in compiler design

Unit – I Introduction to Compiling

Compilers – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens.

Unit – II Syntax Analysis

Role of the parser –Writing Grammars –Context-Free Grammars – Top Down parsing – Recursive Descent Parsing – Predictive Parsing – Bottom-up parsing – Shift Reduce Parsing – Operator Precedent Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser.

Unit – III Intermediate Code Generation

Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back patching – Procedure calls.

Unit – IV Code Optimization and Run Time Environments

Introduction– Principal Sources of Optimization – Optimization of basic Blocks – DAG representation of Basic Blocks - Introduction to Global Data Flow Analysis – Runtime Environments – Source Language issues – Storage Organization – Storage Allocation strategies – Access to non-local names – Parameter Passing, Error detection and recovery.

Unit – V Code Generation

Issues in the design of code generator – The target machine – Runtime Storage management – Basic Blocks and Flow Graphs – Next-use Information – A simple Code generator – Peephole Optimization.

Text Books

1. Alfred V. Aho, Jeffrey D Ullman, “Compilers: Principles, Techniques and Tools”, Pearson Education Asia, 2008
2. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", BS Publications, 2005
3. Dhamdhere, D. M., "Compiler Construction Principles and Practice", 2nd edition, Macmillan India Ltd., New Delhi, 2008

Reference books

1. Allen I. Holub, “Compiler Design in C”, Prentice Hall of India, 2003
2. C. N. Fischer and R. J. LeBlanc, “Crafting a compiler with C”, Benjamin Cummings, 2003
3. Henk Alblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI, 2001
4. Kenneth C. Louden, “Compiler Construction: Principles and Practice”, Thompson Learning, 2003

CS407 Network Security

3-0-0-3

Objectives

- To understand the network security, services, attacks, mechanisms, types of attacks
- To comprehend and apply authentication services, authentication algorithms
- To comprehend and apply network layer security protocols, Transport layer security protocols, Web security protocols.

Outcomes

- Be able to determine appropriate mechanisms for protecting the network.
- Design a security solution for a given application, system with respect to security of the system

Unit -I

Overview of Network Security, Security services, attacks, Security Issues in TCP/IP suite-Sniffing, spoofing, buffer overflow, ARP poisoning, ICMP Exploits, IP address spoofing, IP fragment attack, routing exploits, UDP exploits, TCP exploits.

Unit-II

Authentication requirements, Authentication functions - Message Authentication Codes - Hash Functions - Security of Hash Functions and MACs - MD5 message Digest algorithm - Secure Hash Algorithm - RIPEMD - HMAC Digital Signatures, Authentication protocols-Kerberos, X.509.

Unit-III

IP Security-AH and ESP, SSL/TLS, SSH, Web Security-HTTPS, DNS Security, Electronic Mail Security (PGP, S/MIME).

Unit-IV

Intruders, Viruses, Worms, Trojan horses, Distributed Denial-Of-Service (DDoS), Firewalls, IDS, Honey nets, Honey pots.

Unit-V

Introduction to wireless network security, Risks and Threats of Wireless networks, Wireless LAN Security (WEP, WPA).

Text Books

1. W. Stallings, “Cryptography and Network Security: Principles and Practice”, 5/E, Prentice Hall, 2013
2. Yang Xiao and Yi Pan, “Security in Distributed and Networking Systems”, World Scientific, 2007, Chapter 1.
3. Aaron E. Earle, “Wireless Security Handbook”, Auerbach publications, Taylor & Francis Group, 2006.

Reference Books

- Atul Kahate, “Cryptography and Network Security”, Tata McGraw-Hill, 2003

CS409 Web Technology Laboratory

0-0-2-2

Objectives

- To learn the basics in web designing using HTML, CSS, and XML
- To develop web applications using JSP, Servlets, PHP, and Net Beans

Outcomes

- Ability to design and develop web pages using HTML, CSS, and XML
- Ability to design and deploy real world applications using client side and server side scripting languages

Experiments

- Designing static web pages using HTML
- Designing dynamic web pages using different cascading style sheets
- Designing XML Schemas
- Programs using Java Script
- Programs using Java servlets and JSP
- Designing web applications using PHP
- Designing web applications in Net Beans Environment
- Database Connectivity with MySQL using Java Servlets, JSP, and PHP

CS411 Compiler Design Laboratory

0-0-2-2

Objectives

- To provide practical programming skills necessary for designing and implementing the various phases of a compiler
- To learn and use the compiler construction tools such as LEX and YACC for implementing the various phases of a compiler

Outcomes

- Ability to apply knowledge of LEX and YACC tools to develop a new compiler
- Ability to optimize a code

Experiments

1. Develop programs to implement regular expression to recognize and validate tokens
2. Develop programs to implement a Lexical Analyzer using LEX/FLEX for identifying and validating tokens of a language
3. Develop programs to identify left recursions and left factors and eliminate them from the grammar given
4. Develop programs using YACC to construct a parse tree and check the syntax of the statement
5. Develop programs using LEX & YACC to generate Intermediate code for a given fragment of a program
6. Develop program to optimize the intermediate codes
7. Develop program to generate an equivalent assembly program for a given HLL program fragment

EIGHTH SEMESTER

HM402 Software Project Management

3-0-0-3

Objectives

- To understand the basic concepts and issues of software project management
- To understand successful software projects that support organization's strategic goals

Outcomes

- Ability to maintain software projects and monitor software project process
- Ability to design and develop project modules and assign resources

Unit – I SPM concepts

Definition – components of SPM – challenges and opportunities – tools and techniques – managing human resource and technical resource – costing and pricing of projects – training and development – project management techniques.

Unit – II Software Measurements

Monitoring & measurement of SW development – cost, size and time metrics – methods and tools for metrics – issues of metrics in multiple projects.

Unit – III Software Quality

Quality in SW development – quality assurance – quality standards and certifications – the process and issues in obtaining certifications – the benefits and implications for the organization and its customers – change management.

Unit – IV Risk Issues

The risk issues in SW development and implementation – identification of risks – resolving and avoiding risks – tools and methods for identifying risk management.

Unit – V SPM Tools

Software project management using Primavera & Redmine and case study on SPM tools.

Text Books

1. Richard H. Thayer, "Software Engineering Project Management", John Wiley & Sons, 2nd edition, 2001
2. Royce, Walker, "Software Project Management", Pearson Education, 2002
3. Kelker, S. A., "Software Project Management", Prentice Hall, 2003

List of Elective Subjects

CS313 Human Computer Interaction

3-0-0-3

Objectives

- To gain knowledge on the interplay between humans, tasks, technology, and contexts
- To gain knowledge on important human factors that affect HCI
- To be able to apply HCI principles, guidelines, methods, and techniques

Outcomes

- Ability to comprehend the basics of human and computational abilities and limitations
- Ability to evaluate the quality of a user interface
- Ability to apply appropriate HCI techniques to design systems that are usable by people

Unit – I

Introduction to Human-computer Interaction - Methodology for Designing User-computer Interfaces -Task analysis -Conceptual, semantic, syntactic, and lexical levels of the

Unit – II

Design of an interactive system - Interaction Styles -Question and answer -Form-based -Command language -Menus -Natural language -Direct manipulation -Virtual Reality -Augmented Reality -Other emerging interaction styles

Unit – III

Design and Evaluation Process -Prototyping -Testing and evaluating interface designs -Guidelines and criteria for designing UI, UI Software and Specifications -Languages and tools for specifying and building interfaces -Dialogue independence –UIMS Languages and software abstractions -Programming support tools -. Basic Interaction Tasks, Techniques, and Devices

Unit – IV

Human Performance -Scientific foundations for designing user interfaces -Visual presentation of information -Graphical design -Designing experiments - Introduction to Research in Human-Computer Interaction -Why do HCI research? -Research prototypes -Interdisciplinary nature of HCI research -Examples of HCI research

Unit – V

New Interaction Techniques -New modes of human-computer communication -Voice Gesture -Eye movement -Tangible user interfaces -Brain-computer interfaces - Case Study.

Reference Books

1. Wilbert O Galitz, “The Essential Guide To User Interface Design”, Wiley Dreamatech, 3rd edition, 2007
2. Ben Shneidermann, “Designing The User Interface - Strategies for Effective Human-Computer Interaction”, 4th Edition, Pearson Education Asia, 2004
3. Alan Dix, Janet Fincay, Gre Goryd, Abowd, and Russell Bealg, “Human – Computer Interaction”, 3rd edition, Pearson, 2003
4. Yvonne Rogers , Helen Sharp, and Jenny Preece, “Interaction Design: Beyond Human - Computer Interaction”, 3rd edition, Wiley, 2011

CS315 Multimedia Systems

3-0-0-3

Objectives

- To understand the different media and design issues in multimedia systems
- To understand Multimedia security and data hiding for image/video

Outcomes

- To design multimedia components efficiently
- To develop integrated, collaborative multimedia systems
- To develop data hiding algorithms for the specialized applications

Unit – I Multimedia Elements

Introduction – Definitions – Applications – Elements - Text – Image/Graphics Audio – Video – Animation

Unit – II Data and File Formats

Compression Techniques – Lossless, Lossy – JPEG, MPEG, TIFF, RIFF- H.261, H.262, H.263 -File formats-Display Technologies

Unit – III Multimedia Networks

Protocol - QOS Issues - RTP, RTCP, RTSP, SIP - Media on demand –ITV - STB Broadcast Schemes for VoD Buffer Management- Multimedia over wireless networks

Unit – IV Multimedia Security and Forensics

Multimedia encryption - Digital Watermarking - Security Attacks- Digital Forensics taxonomy, goals/requirements - Forensic Data Acquisition -Forensics Analysis and Validation

Unit – V Multimedia Data Hiding

Overview– Data hiding framework-Key elements -Basic embedding mechanisms-Techniques for Embedding multiple bits-Quantitative model for Uneven embedding Capacity- CER-VER -Data Hiding in Binary image-Multilevel embedding-Multilevel image and video data hiding

Text Books

1. K. Andleigh, Kiran Thakrar , Multimedia Systems Design, PHI, 2007
2. Ze Nian Li, S. Drew, “Fundamentals of Multimedia”, PHI, 2006.

Reference Books

1. Ralf Steinmetz and Klara, “Multimedia Computing, Communications and Applications”, Pearson Education, 2009
2. Min Wu, Bede Liu, “Multimedia Data Hiding”, Springer-Verlag, 2002
3. I. Cox, M. Miller, and J. Bloom, "Digital Watermarking", Morgan Kaufman Publishers, 2001
4. Chun-Shien Lu, “Multimedia Security : Steganography and Digital Watermarking techniques for Protection of Intellectual Property”, Springer Inc 2007
5. Wenjun Zeng, Heather Yu and Ching, Yung Lin, “Multimedia Security technologies for Digital rights Management”, Elsevier Inc 2006

CS317 Mobile Computing and Communication

3-0-0-3

Objectives

- To understand the fundamentals of wireless communication.
- To understand the architecture of various Wireless Communication Networks.
- To understand the significance of different layers in mobile system

Outcomes

- Ability to develop a strong grounding in the fundamentals of mobile Networks
- Ability to apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network

Unit – I

Introduction to Wireless Networks – Applications – History – Simplified Reference Model – Wireless transmission – Frequencies – Signals – Antennas – Signal propagation – Multiplexing – Modulation – Spread spectrum – Cellular Systems: Frequency Management and Channel Assignment- types of hand-off and their characteristics

Unit – II

MAC – Motivation – SDMA, FDMA, TDMA, CDMA –Telecommunication Systems – GSM: Architecture-Location tracking and call setup- Mobility management- Handover- Security- GSM SMS –International roaming for GSM- call recording functions-subscriber and service data management – DECT – TETRA – UMTS – IMT-2000

Unit – III

Wireless LAN – Infrared Vs Radio transmission – Infrastructure – Adhoc Network –IEEE 802.11WLAN Standards – Architecture – Services– HIPERLAN – Bluetooth Architecture & protocols

Unit – IV

Mobile Network Layer – Mobile IP – Dynamic Host Configuration Protocol. 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 – V

WAP Model- Mobile Location based services -WAP Gateway –WAP protocols – WAP user agent profile- caching model-wireless bearers for WAP - WML WMLScripts - WTA - iMode- SyncML.

Text Books

1. Jochen Schiller, " Mobile Communication", 2nd Edition,Pearson Education, 2008.
2. Theodore and S. Rappaport, "Wireless Communications, Principles, Practice", 2nd Ed PHI, 2002

Reference Books

1. William Stallings, "Wireless Communications and Networks", 2nd Edition, Pearson Education, 2004
2. C.Siva Ram Murthy and B.S.Manoj, "Adhoc Wireless Networks: Architectures and Protocols", 2nd Edition, Pearson Education, 2008
3. Vijay. K. Garg, "Wireless Communication and Networking", Morgan Kaufmann Publishers, 2007.

CS314 Wireless Network Systems

3-0-0-3

Objectives

- To understand the fundamentals of wireless communication
- To understand the architecture of different Wireless Networks
- To understand the significance of MAC and Network layers in Wireless Network System

Outcomes

- Be able to make critical assessment of wireless networks
- Develop a strong grounding in the fundamentals of Wireless Networks
- Apply the knowledge gained in the development of MAC, Network Layer protocols of Wireless Network

Unit – I Wireless Communications & Cellular System Fundamentals

Introduction to wireless communications systems, examples, comparisons and trends. Cellular systems, Frequency Management and Channel Assignment- types of handoff and their characteristics, dropped call rates & their evaluation. MAC techniques for Wireless Communication: FDMA, TDMA, MA (FHMA/CDMA/Hybrid techniques), SDMA techniques

Unit – II Wireless WAN

First Generation Analog, Second Generation TDMA – GSM, Short Messaging Service in GSM, Second Generation CDMA – IS-95, GPRS - Third Generation Systems (WCDMA/CDMA 2000)

Unit – III Wireless LAN

Introduction to wireless LANs - IEEE 802.11 WLAN – Architecture and Services, Physical Layer, MAC sublayer- MAC Management Sublayer, Other IEEE 802.11 standards, HIPERLAN, WiMax standard.

Unit – IV Adhoc and Sensor Networks

Characteristics of MANETs, Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks- Classification, MAC and Routing protocols.

Unit – V Wireless MAN and PAN

Wireless MANs – Physical and MAC layer details, Wireless PANs – Architecture of Bluetooth Systems, Physical and MAC layer details, Standards.

Text Books

1. William Stallings, "Wireless Communications and networks" Pearson / Prentice Hall of India, 2nd Ed., 2007
2. Dharma Prakash Agrawal & Qing-An Zeng, “Introduction to Wireless and Mobile Systems”, Thomson India Edition, 2nd Ed., 2007
3. Theodore, S. Rappaport, “Wireless Communications, Principles, Practice”, 2nd Ed., PHI, 2002

Reference Books

1. C. Siva Ram Murthy and B. S. Manoj, “Adhoc Wireless Networks: Architectures and Protocols”, 2nd Edition, Pearson Education, 2008
2. Jochen Schiller, “Mobile Communications”, Person Education, 2nd Ed., 2008
3. Vijay. K. Garg, “Wireless Communication and Networking”, Morgan Kaufmann Publishers, 2007
4. Kaveth Pahlavan, Prashant Krishnamurthy, "Principles of Wireless Networks", Pearson Education Asia, 2002

CS316 Design and Analysis of Parallel Algorithms

Objectives

- To understand parallel computing algorithms and models
- To analyze parallel algorithms for PRAM machines and various interconnection networks

Outcome

- Ability to design and analyze parallel algorithms for PRAM machines

Unit – I

Introduction to Parallel Computers - SIMD - EREW, CREW - SM-SIMD algorithms - Shared memory SIMD - Tree and mesh interconnection computers - Classifying MIMD Algorithms - Hypercube SIMD Model.

Unit –II

Selection and Sorting – Sequential algorithm - Algorithm for parallel selection - Sorting on a linear array – broadcasting a datum- Computing all sums- Sorting on a mesh - Sorting on EREW SIMD computer - enumeration sort – parallel quick sort – hyper quicksort Sorting on other networks - Sorting on other networks.

Unit – III

Matrix operations - Mesh transpose – Shuffle transpose - EREW transpose - Mesh multiplication - Cube multiplication - Matrix by vector multiplication - Tree multiplication.

Unit – IV

Numerical problems - Linear equations - SIMD algorithm - Roots of nonlinear equations - MIMD algorithm - Partial differential equations - Computing Eigen values. Monte Carlo methods – parallel random number generators – random number distributions.

Unit – V

Graph problems –Definitions - Graph coloring - Computing the connectivity matrix - Finding connected components - Traversal - Minimal alpha-beta tree - Minimum Cost Spanning Tree-Addition tree-Multiplication tree.

Text Book

- S. G. Akl, "The Design and Analysis of Parallel Algorithms", Prentice Hall of India, 1989

Reference Book

1. B. Wilkinson and M. Allen, “Parallel Programming – Techniques and applications using networked workstations and parallel computers”, 2nd Edition, Pearson Education, 2005
2. Michael J. Quinn, “Parallel Computing : Theory & Practice”, Tata McGraw Hill, 2003
3. S. Lakshmivarahan and S. K. Dhall, "Analysis and Design of Parallel Algorithms - Arithmetic and Matrix Problems", Tata McGraw Hill, 1990

CS318 Principles of Processor Design

3-0-0-3

Objectives

- To understand the basics of Verilog HDL
- To study about the design aspects of various circuits using Verilog

Outcome

- Ability to design and implement a CPU to exploit the full capability of Verilog HDL

Unit – I

Digital Design Flow in Verilog –Design entry - Testbench in Verilog - Design validation - Compilation and synthesis - Postsynthesis simulation - Timing analysis - Hardware generation- Verilog HDL –Verilog evolution- Verilog attributes - Verilog language RT level design – Control/data partitioning - Data part- Control part- Elements of Verilog –Hardware modules - Primitive instantiations- Assign statements - Condition expression - Procedural blocks- Module instantiations- Component description in Verilog – Test benches.

Unit – II

Verilog Language Concepts – Hardware languages-Timing- Concurrency- Timing and concurrency example – Module basics – Verilog simulation model –Continuous assignments- Procedural assignments- Compiler directives – System task and function.

Unit – III

Combinational and Sequential Circuits Description - Module wires – Gate level logic – Hierarchial logic-Describing Expressions with Assign Statements-Behavioral Combinational Descriptions- Sequential models – Basic memory components – Functional registers – State machine coding – Combinational and sequential synthesis – Latches – Flip flops – Counters.

Unit – IV

Design Examples – Bus structure – Simple processor – Timer – SRAM – Cache – Clock synchronization, Digital filters and signal processors-Pipelined Architectures-Halftone Pixel Image Converter

Unit – V

Register Transfer Level Design and Test – Sequential multiplier –Shift-and-add multiplication process- Sequential multiplier design - Multiplier testing- Von Neumann computer model – Processor and memory model- Processor model specification- Designing the adding CPU- Design of datapath - Control part design- Adding CPU Verilog description- Testing adding CPU- CPU design and test

Text Books

1. Zainalabedin Navabi, "Verilog Digital System Design", 2nd Edition, McGraw Hill, 2008

Reference Books

1. Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL" 2nd edition, Pearson Edition, 2009

CS320 Data Warehousing and Data Mining

3-0-0-3

Objectives

- To understand the principles of Data Warehousing and Data Mining
- To know the Architecture of a Data Mining system
- To perform classification, association, and prediction of data

Outcome

- To apply the Data Mining techniques in real time applications

Unit – I

Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – Data Warehouse Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

Unit – II

Data Mining: Databases – Steps in Data mining process- Data Mining Functionalities- Architecture of a Typical Data Mining Systems- Classification of Data Mining Systems.
Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation

Unit – III

Classification and Prediction: Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Unit – IV

Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining. Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods

Unit – V

Applications of Data mining-Social Impacts of Data mining-Tools- Mining the World Wide Web– Spatial Data Mining – Multimedia Data Mining – Text Mining.

Text Book

1. Jiawei Han, Micheline Kamber, and Jian Pei, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011

Reference Books

1 Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007

2 K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006
3 G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006
4 Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007

CS322 Real Time Systems

3-0-0-3

Objectives

- To study issues related to the design and analysis of systems with real-time constraints.
- To learn the features of Real time OS.
- To study the various Uniprocessor and Multiprocessor scheduling mechanisms.
- To learn about various real time communication protocols.
- To study the difference between traditional and real time databases

Outcomes

- Knowledge about Schedulability analysis.
- Ability to learn Real-time programming environments.
- Knowledge about real time communication and databases.
- Ability to develop real time systems.

Unit – I

Introduction to real-time computing - Structure of a real-time system - Characterization of real-time systems and tasks - Performance measures.

Unit – II

Task Assignment and Scheduling - Uniprocessor scheduling algorithms - Task assignment - Mode changes - Fault tolerant scheduling.

Unit – III

Real-time Communication - Network topologies and architecture issues - Protocols - Contention-based, token-based, polled bus - Fault tolerant routing.

Unit – IV

Real-time Databases - Transaction priorities and aborts - Concurrency control issues - Scheduling algorithms - Two-phase approach to improve predictability.

Unit – V

Programming Languages and Tools - Hierarchical decomposition - Run-time error handling - Overloading - Timing specification - Recent trends and developments.

Text Book

- C. M. Krishna and Kang G. Shin, "Real-Time Systems", International Edition, McGraw Hill Companies, Inc., New York, 1997

Reference Books

- Rajib Mall, "Real-Time Systems: Theory and Practice", 1st edition, Pearson Education, 2012

CS413 Big Data Analytics

3-0-0-3

Objectives

- To understand the financial value of big data analytics
- To explore tools and practices for working with big data
- To understand how big data analytics can leverage into a key component

Outcomes

- Ability to apply the concepts of big data analytics for a domain
- Ability to design and develop Hadoop and Map Reduce Framework
- Ability to contextually integrate and correlate large amounts of information

UNIT – I Introduction to Big Data

Analytics – Nuances of big data – Value – Issues – Case for Big data – Big data options Team challenge – Big data sources – Acquisition – Features of Big Data - Security, Compliance, auditing and protection - Evolution of Big data – Best Practices for Big data Analytics - Big data characteristics - Volume, Veracity, Velocity, Variety – Big Data Architecture – Big Data and Cloud.

UNIT – II Data Analysis

Evolution of analytic scalability – Convergence – parallel processing systems – Cloud computing – grid computing – Map reduce Basics – MapReduce Algorithm Design -enterprise analytic sand box – analytic data sets – Analytic methods – analytic tools – Cognos – Microstrategy – Pentaho - Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods.

UNIT - III Stream Computing

Introduction to Streams Concepts – Stream data model and architecture - Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window - Realtime Analytics Platform(RTAP) applications IBM Infosphere – Big data at rest – Infosphere streams – Data stage – Statistical analysis – Intelligent scheduler – Infosphere Streams.

UNIT – IV Predictive Analytics and Visualization

Predictive Analytics – Supervised – Unsupervised learning – Neural networks – Kohonen models – Normal – Deviations from normal patterns – Normal behaviours – Expert options – Variable entry - Mining Frequent itemsets - Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications.

UNIT – V Frameworks and Applications

IBM for Big Data – Map Reduce Framework - Hadoop – Hive – Sharding - MongoDB – NoSQL Databases - S3 - Hadoop Distributed file systems – Hbase – Impala – Analyzing big data with Twitter and Facebook – Big data for E-commerce – Big data for blogs.

Text Books/Reference Books

1. Frank J Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series, 2012.
2. Colleen Mccue, "Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis", Elsevier, 2007
3. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
4. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", Wiley and SAS Business Series, 2012.
6. Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill, 2011.
7. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch , James Giles, David Corrigan, "Harness the Power of Big data – The big data platform", McGraw Hill, 2012.
8. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007
9. Pete Warden, Big Data Glossary, O'Reilly, 2011.
10. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.
11. Data-Intensive Text Processing with MapReduce, Jimmy Lin and Chris Dyer University of Maryland, College Park. Morgan & Claypool Publishers.

CS415 Cloud Computing

3-0-0-3

Objectives

- To provide comprehensive knowledge of fundamental concepts and of cloud computing
- To demonstrate an understanding of Service models, deployment models, Virtualization
- To describe the programming and software environments of Cloud
- To shed light on the security issues in Cloud

Outcomes

- Ability to articulate the Virtualization concepts
- Ability to identify the architecture, service models and deployment models of Cloud
- Ability to master the programming aspects of Cloud

Unit – I

Overview of Distributed Computing, Cluster Computing and Grid Computing – Technologies for Network based systems – Software environments for Distributed Systems and Clouds – Overview of Services and Service oriented Architecture.

Unit – II

Virtual Machines and Virtualization – Implementation levels of Virtualization – Virtualization structures/tools and Mechanisms – Virtualization of CPU, Memory and I/O Devices – Storage Virtualization

Unit – III

Cloud Computing – Properties – challenges – Service models – IaaS, PaaS and SaaS Deployment models – Service Composition and orchestration – Architecture design of Compute and Storage cloud – Public Cloud Platforms – Inter Cloud Resource Management.

Unit – IV

Cloud Programming and Software Environments – Parallel and Distributed Programming paradigms – Programming on AWS, Azure and GAE – Cloud software environments Eucalyptus – OpenStack – Open Nebula.

Unit – V

Cloud Security – Infrastructure security – Data security – Identity and access management Privacy- Audit and Compliance.

Text Book

- Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier, 2012

Reference Books

1. Barrie Sosinsky, "Cloud Computing Bible" John Wiley & Sons, 2010
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy An Enterprise Perspective on Risks and Compliance", O'Reilly 2009

CS417 Artificial Intelligence and Expert Systems

3-0-0-3

Objectives

- To learn the concepts of Artificial Intelligence
- To learn the methods of solving problems using Artificial Intelligence
- To introduce the concepts of Expert Systems and machine learning

Outcomes

- Ability to identify problems that are amenable solution by AI methods to solve a given problem
- Ability to design and carry out an empirical evaluation of different algorithms

Unit – I

Introduction to AI, Control strategies, Search strategies, Production system characteristics - Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.

Unit – II

Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.

Unit – III

Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.

Unit – IV

Basic plan generation systems - Strips -Advanced plan generation systems – K strips -Strategic explanations -Why, Why not and how explanations. Learning- Machine learning, adaptive Learning

Unit – V

Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition – Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells

Text Books

1. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, McGraw Hill, 2008
2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007

Reference Books

1. Peter Jackson, “Introduction to Expert Systems”, 3rd Edition, Pearson Education, 2007
2. Stuart Russel and Peter Norvig, “AI – A Modern Approach, Pearson Education, 2nd Edition, 2007

CS419 Programming for Embedded Systems

3-0-0-3

Objectives

- To understand basics of embedded system programming
- To know how the intricacies of Embedded programming

Outcomes

- Ability to design and develop application Specific embedded System
- Ability to comprehend the importance of Embedded programming for real time systems

Unit – I Introduction to Embedded System Programming

Application of Embedded System, Overview of Embedded System Architecture and Instruction Set, Real Time Systems, Requirements for Embedded Systems, Embedded Software Development: Challenges and Issues, Operating Systems for Embedded Systems: Introduction and Features, Languages for Embedded System Programming

Unit – II Getting Started with Embedded Programming

Assembly verses High Level language, Integrated Development Environment, Building Process for Embedded System, Types of Memory for Embedded System, Memory Management methods and Bug Handling, Interrupts and ISRs handling in Embedded Systems, Simulators and Debuggers for Embedded System

Unit – III Designing Elements of Embedded System Program

Basic Input Output Device Interface Programming, Developing Programmable Interrupt Controller, Timers and Counters, LCD hardware and Programming, Analog to Digital Clock, Introduction to data EEPROM

Unit – IV Real Time Programming for Embedded System

Scheduling in Real Time Environment, Real Time Clock Designing, Real Time Operating System Support for Programming, Task Management in Real Time Environment, Semaphores handling, Message Queuing: States, Content, Storage, Introduction to Kernel Objects

Unit – V Case Study on Embedded System Programming

Cruise Controller in Transportation, Bioinformatics on Embedded System, Mobile Phones and Handheld Devices, Applications in Medical Field, Low Power Systems, Reconfigurable Systems, Wireless Communication in Embedded Systems, Wearable Embedded Systems

Reference Books

1. Julio Sanchez and Maria P. Canton, “Embedded Systems Circuits and Programming”, Taylor and Francis, 2012
2. Michael Barr and Anthony Massa, “Programming Embedded Systems: With C and GNU Development Tools, O’Reilly, 2007
3. Sriram V Iyer and Pankaj Gupta, “Embedded Real Time System Programming”, Tata McGraw Hill, 2004
4. Qing Li and Caroline Yao, “Real-Time Concepts for Embedded Systems”, Elsevier, 2003
5. Cracking the Code Programming For Embedded System, Dreamtech Software Team, Wiley, 2002

CS421 Advanced Cryptography

3-0-0-3

Objectives

- To study the concepts of applied cryptography
- To understand the application of cryptographic techniques in real world applications
- To comprehend the notion of provable security and its implication with improved security guarantees

Outcomes

- Ability to break cryptosystems that are not provably secure
- Ability to derive simple provable security proofs for cryptographic schemes
- Ability to design and implement cryptographic protocols

Unit – I

Review of number theory, group, ring and finite fields, quadratic residues, Legendre symbol, Jacobi symbol,

Unit – II

Formal Notions of Attacks: Attacks under Message Indistinguishability: Chosen Plaintext Attack(IND-CPA), Chosen Ciphertext Attacks (IND-CCA1 and IND-CCA2), Attacks under Message Non-malleability: NM-CPA and NM-CCA2, Inter-relations among the attack model.

Unit – III

Public key cryptography, RSA cryptosystem, probabilistic encryption, homomorphic encryption, Elliptic curve cryptosystems, Blum-Goldwasser cryptosystems, identity based encryption, Cryptographic hash functions.

Unit – IV

Digital signatures and the notion of existential unforgability under chosen message attacks, ElGamal digital signature scheme, Schnorr signature scheme, blind signature, electronic voting.

Unit – V

Zero Knowledge Proofs and Protocols, lattice based cryptography

Reference Books

1. W. Mao, "Modern Cryptography: Theory & Practice", Pearson Education, 2010
2. Jeffrey Hoffstein, Jill Pipher, and Joseph H. Silverman, **"**An Introduction to Mathematical Cryptography", Springer publication
3. Koblitz, N., "Course on Number Theory and Cryptography", Springer Verlag, 1986
4. Menezes, A, et.al., "Handbook of Applied Cryptography", CRC Press, 1996

Thomas Koshy, "Elementary Number Theory with applications", Elsevier India, 2005

CS402 Randomized Algorithms

3-0-0-3

Objectives

- To introduce randomized algorithms at undergraduate level
- To introduce the concepts of probabilistic analysis of algorithms

Outcomes

- Ability to apply basics of probability theory in the analysis of algorithms
- Ability to design and implement randomized techniques in solving real world problems

Unit – I

Elements of probability theory, Verification of strings, poly identities, matrix multiplication Las Vegas and Monte Carlo algorithms, Expectations, Jensen's Inequality, Coupon collector's problem, geometric distribution

Unit – II

Randomized Quick Sort and its expected run-time, Variance and moments, Chebyshev's inequality, Coupon collector's problem, randomized median finding, analysis, moment generating functions

Unit – III

Derivation and application of Chernoff's bounds, Sum of Poisson Trials, Coin flips, Set balancing, Packet routing in sparse networks, permutation routing on the hypercube, butterfly

Unit – IV

Birthday paradox, balls and bins model, application to bucket sort, Poisson distribution, Application to hashing, random graph models, Hamiltonian cycles in random graphs

Unit – V

Markov chains, representations, randomized algorithm for 2-satisfiability and 3-satisfiability, classification of states, gambler's ruin, random walks on undirected graphs, s-t connectivity algorithm.

Text book

- M. Mitzenmacher and E. Upfal, “Probability and computing: Randomized algorithms and Probabilistic analysis”, Cambridge, 2005

CS404 Natural Language Processing

3-0-0-3

Objectives

- To understand the application of computational methods in linguists
- To apply statistical and probabilistic methods for parameter estimation and inference
- To know how the computational methods give insight into observed human language phenomena

Outcomes

- Ability to compare and contrast approaches to natural language processing
- Ability to comprehend and analyze the various elements speech
- Ability to design and develop machine learning techniques in the area of NLP

Unit – I

Sound: Biology of Speech Processing; Place and Manner of Articulation; Word Boundary Detection; Argmax based computations; HMM and Speech Recognition.

Unit – II

Words and Word Forms: Morphology fundamentals; Morphological Diversity of Indian Languages; Morphology Paradigms; Finite State Machine Based Morphology; Automatic Morphology Learning; Shallow Parsing; Named Entities; Maximum Entropy Models; Random Fields.

Unit – III

Structures: Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents; Hybrid of Rule Based and Probabilistic Parsing; Scope Ambiguity and Attachment Ambiguity resolution.

Unit – IV

Meaning: Lexical Knowledge Networks, Wordnet Theory; Indian Language Wordnets and Multilingual Dictionaries; Semantic Roles; Word Sense Disambiguation; WSD and Multilinguality; Metaphors; Coreferences.

Unit – V

Web 2.0 Applications: Sentiment Analysis; Text Entailment; Robust and Scalable Machine Translation; Question Answering in Multilingual Setting; Cross Lingual Information Retrieval (CLIR).

Text books/Reference books

1. Allen James, "Natural Language Understanding", 2nd edition, Benjamin Cumming, 1995
2. Charniack, Eugene, "Statistical Language Learning", MIT Press, 1993
3. Jurafsky, Dan and Martin, James, "Speech and Language Processing", 2nd Edition, Prentice Hall, 2008
4. Manning, Christopher and Heinrich, Schutze, "Foundations of Statistical Natural Language Processing", MIT Press, 1999

CS406 Network Processor Design

3-0-0-3

Objectives

- To understand the basics of networking and network processor architecture
- To understand basic concepts of processor scheduling and various parameters used for measuring performance of the network processor

Outcomes

- Ability to comprehend the network processor and its communication mechanisms
- Ability to design and implement various programming aspects of network processors

Unit – I

Introduction and motivation - Network processor Ecosystem-communication system and implementation-Network element-. Networking Fundamentals - Converged Networks-Access and Home Networks- Network processor Architecture.

Unit – II

Processor scheduling- Fibre channel/ Infiniband Implementation. Performance And Analysis Packet Processing-Framing-parsing and classification- search , Lookup and Forwarding-Compression and encryption- Queueing and Traffic Management-Packet flow handling-NP Peripherals

Unit – III

Worst Case Excution Time Estimation for Hardware Assisted Multithreaded processor-Power consideration in NP Design. Performance and Programmability of processing Element Topologies for NP-Packet classification Termination in a Protocol-Programmable Protocol Processor-Control memory Aceess Accelerator- System performance.

Unit – IV

Efficient and Faithful Performance Modeling for NP Based system designs - Direction in Packet Classification for Network Processors. A Network Processor: EZchip - EZchip Architecture, Capabilities, and Applications- EZchip Programming-Parsing-Searching-Resolving-Modifying.

Unit – V

Running the Virtual Local Area Network Example-Writing Your First High-Speed Network Application . Implementing High performance , High-value Traffic management using Agere Network Processor Solutions- Nepal: A Framework for Efficiently structuring Applications for NP.

Text Books

- Ran Giladi, "Network Processors Architecture, Programming, and Implementation", Morgan Kaufmann Publishers, 2008

Reference Books

- Patric Crowley, Mark A. Franklin , Haldun Hadimioglu, and Peter Z. Onufryk, "Network Processors Design: Issues and Practices (Volume-2)", 2004

CS408 Image Processing

3-0-0-3

Objectives

- To understand the fundamentals of Digital imaging and Image Processing techniques
- To be familiar with image compression and segmentation

Outcomes

- Ability to design and apply image enhancement and restoration techniques
- Ability to apply image compression and segmentation Techniques

Unit – I

Introduction: Fundamentals of Image Processing, Applications of Image Processing, Human Visual Perception, Introduction to Image Formation, Sampling and Quantization, Binary Image, Three-Dimensional Imaging, Image file formats. Color and Color Imagery: Perception of Colors

Unit – II

Image Transformation: Fourier Transforms, Discrete Cosine Transform, Walsh-adamard Transform, Karhaunen-Loeve Transform or PCA. Discrete Wavelet Transform: Wavelet Transform, Extension to 2D Signals, Lifting Implementation of the Discrete Wave Transforms

Unit – III

Image Enhancement and Restoration : Introduction, Distinction between image enhancement and restoration, Histrogram-based Contrast Enhancement, Frequency Domain Methods of Image Enhancement, Noise Modeling, Image Restoration, Image Reconstruction, Image Segmentation

Unit – IV

Recognition of Image Patterns : Introduction, Decision Theoretic Pattern Classification, Baesian Decision Theory, Nonparametric Classification, Linear Discriminant Analysis, Unsupervised Classification Strategies-clustering, K-means clustering algorithm, Syntactic Pattern Classification, Syntactic Inference, Symbolic Projection method. Texture and Shape Analysis

Unit – V

Fuzzy Set Theory in Image Processing : Introduction, Use of Fuzzy Image, Preliminaries and Background, Image as a Fuzzy Set, Fuzzy Methods of Contrast Enhancement, Image Segmentation using Fuzzy Methods, Fuzzy Approaches to Pixel Classification, Fuzzy c-Means Algorithm, Fusion of Fuzzy logic with neural network. Image mining and Content-Based Retrieval

Text Book

- Tinku Acharya and Ajoy K. Ray, “Image Processing Principles and Applications”, John Wiley & Sons publishers, 2005

Reference Book

- Maria Petrou and Costas Petrou , “Image Processing the Fundamentals”, John-Wiley and Sons Publishers, 2nd edition, 2010
- Rafael C. Gonzalez , Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", 2nd edition, Gatesmark Publishing, 2009

CS410 Software Quality Assurance

3-0-0-3

Objectives

- To understand software quality management process and quality management models
- To learn software quality metrics, assurance and various software standards

Outcome

- Ablility to apply basic software quality assurance practices to ensure software quality and standards

Unit – I

Defining Software Quality, Software Quality factors, Components of software quality assurance, pre project software quality components- Contract Review - Development and Quality Plans.

Unit-II

Integrating Quality Activities in the Project Life Cycle – Reviews - Software Testing – Strategies - Software Testing –Implementation - Assuring the Quality of Software Maintenance - Assuring The Quality of External Participants' Parts - Case Tools and their Affect on Software Quality.

Unit-III

Software Quality Infrastructure Components- Procedures and Work Instructions - Supporting Quality Devices - Staff Training, Instructing and Certification - Preventive and Corrective Actions - Configuration Management - Documentation and Quality Records Controls

Unit-IV

Management Components Software Quality - Project Progress Control- Components, Internal & External Participants, Progress control regimes, Computerized tools, Software Quality Metrics – Objective, Classification, Process & Product Metrics, Implementation & Limitation of Software Metrics - Software Quality Costs – Objective, Classification Model of cost, Extended Model and Applications

Unit-V

Standards, Certification And Assessment - Need for standards, SQA Standards – ISO9001 Certification - Software Process Assessment, Organizing for Quality Assurance -Management and its Role in Quality Assurance - The Software Quality Assurance Unit - SQA Trustees and Committees, Six Sigma concepts.

Text Books

1. Daniel Galin, “Software Quality Assurance: From Theory to Implementation”, Pearson Addison-Wesley, 2nd edition, 2012
2. Jeff Tian, “Software Quality Engineering: Testing, Quality Assurance, and Quantifiable”, Wiley, 2005

CS412 Advanced Database Management Systems

3-0-0-3

Objectives

- To understand the different database models and language queries to access databases
- To understand the normalization forms in building an effective database tables
- To protect the data and the database from unauthorized access and manipulation

Outcomes

- Ability to write complex queries including full outer joins, self-join, sub queries, and set theoretic queries.
- Technical knowhow of the file organization, Query Optimization, Transaction management, and database administration techniques

Unit – I Relational Model Issues

ER Model - Normalization – Query Processing – Query Optimization – Transaction Processing - Concurrency Control – Recovery - Database Tuning

Unit – II Distributed Databases

Parallel Databases – Inter and Intra Query Parallelism – Distributed Database Features – Distributed Database Architecture – Fragmentation – Distributed Query Processing – Distributed Transactions Processing – Concurrency Control – Recovery –Commit Protocols.

Unit – III Object Oriented Databases

Introduction to Object Oriented Data Bases - Approaches - Modeling and Design - Persistence – Query Languages - Transaction - Concurrency – Multi Version Locks – Recovery – POSTGRES – JASMINE –GEMSTONE - ODMG Model

Unit – IV Emerging Systems

Enhanced Data Models - Client/Server Model - Data Warehousing and Data Mining – Web Databases – Mobile Databases- XML and Web Databases

Unit – V Current Issues

Rules - Knowledge Bases - Active and Deductive Databases - Multimedia Databases Multimedia Data Structures – Multimedia Query languages - Spatial Databases.

Text Books

1. Thomas Connolly and Carlolyn Begg, “Database Systems: A Practical Approach to Design, Implementation, and Management”, 5th Edition, Addison-Wesley, 2009

References

1. R. Elmasri and S. B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson/Addison Wesley, 2006
2. Abraham Silberschatz, Henry F. Korth, and S. Sudharshan, “Database System Concepts”, Fifth Edition, Tata McGraw Hill, 2006
3. C. J. Date, A. Kannan, and S. Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006

Honors Elective

CS451 Distributed Algorithms

3-0-0-3

Objectives

- To understand the fundamental algorithms and protocols that are commonly used in distributed computing
- To learn the basics about synchronous and asynchronous models

Outcomes

- Ability to design and develop distributed algorithms for specific problems
- Ability to design and develop distributed algorithms for real world problems

Unit - I

Introduction, Synchronous Network Model, Leader election in a synchronous ring, Algorithms in general synchronous networks, Distributed consensus with link failures, Distributed consensus with process failures.

Unit - II

Asynchronous system model, Asynchronous shared memory model, mutual exclusion, resource allocation, consensus and atomic objects

Unit - III

Asynchronous network model, basic asynchronous network algorithms and synchronizers

Unit - IV

Shared memory versus networks, logical time, global snapshots and stable properties, network resource allocation, partially synchronous system models.

Unit - V

Fault Tolerance in distributed systems, Fault Tolerance in asynchronous systems, Fault Tolerance in asynchronous systems, failure detection - stabilization

Text Books

1. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers 1996
2. Gerard Tel, “Introduction to Distributed Algorithms”, Cambridge University Press, 2nd edition, 2000

CS452 High Speed Networks

3-0-0-3

Objectives

- To understand up-to-date survey of developments in High Speed Networks
- To know how techniques involved to support real-time traffic and congestion control
- To understand different levels of quality of service (QoS) to different applications

Outcomes

- Ability to design and develop protocols for high speed networks
- Ability to analyze various parameters of high speed networks
- Ability to compare various high speed network architectures

Unit – I

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL, High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs: applications, requirements – Architecture of 802.11

Unit – II

Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control

Unit – III

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management - Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes –Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management

Unit – IV

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

Unit – V

RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP

Text Book

- William Stallings, "High Speed Networks and Internet", Pearson Education, 2nd Edition, 2002

Reference Books

1. Warland, Pravin Varaiya, "High performance communication networks", 2nd Edition, Jean Harcourt Asia Pvt. Ltd., 2001

2. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, “MPLS and VPN architecture”, Cisco Press, Volume 1 and 2, 2003
3. Abhijit S. Pandya and Ercan Sea, “ATM Technology for Broad Band Telecommunication Networks”, CRC Press, New York, 2004

CS453 Software Defined Networking

3-0-0-3

Objectives

- To know the reduced Complexity of Network Operation
- To understand the concepts of minimize Layer and maximize Network Resources
- To understand the Faster Time to Revenue for New Applications

Outcomes

- Ability to comprehend Software Defined Networks
- Ability to design and implement software defined network as per requirements

Unit – I

Introduction, Control Plane, Data Plane, Distributed Control Planes, IP and MPLS, Creating the IP Underlay, Convergence Time, Load Balancing High Availability, Creating the MPLS Overlay, Replication, Centralized Control Planes – Logical Versus Litera, ATM/LANE, Route Servers, Wire Protocol, FAWG, Config and Extensibility, Architecture, Hybrid Approaches – Ships in the Night, Dual Function Switches.

Unit – II

VMware, Nicira, Mininet, NOX/POX, Trema, Ryu, Big Switch Networks/Floodlight, Layer 3 Centric – L3VPN, Path Computation Element Server, Plexxi Affinity, Cisco OnePK, Management Interface, Network Divide, Modern Programmatic Interfaces, Modern Orchestration.

Unit – III

Multitenant Data Center, Virtualized Multitenant Data Center, SDN Solutions for Data Center Network, VLANs, EVPN, VxLan, NVGRE, Virtualization and Data Plane I/O, Services Engineered Path, Service Locations and Chaining, NEV at ETSI, Non-ETSI NEV Work.

Unit – IV

Network Topology, Traditional Methods, LLDP, BGP-TE/LS, ALTO, I2RS, Build Code First, The Juniper SDN Framework(s), Open Daylight Controller/Framework, Policy.

Unit – V

Bandwidth Scheduling, Manipulation, Calendaring - Bandwidth Calendaring, Big Data and Application Hyper – Virtualization for Instant CSPF, Expanding Technology, Use Cases for Data Center Overlays, Big Data, Network Function Virtualization - Data Center Orchestration, Puppet, Network Function Virtualization, Optimized Big Data, Use Cases for Input Traffic Monitoring, Classification and Triggered Actions - Firewall as Service, Network Access Control Replacement, Virtual Firewall, Feed Back and Optimization, Intrusion Detection/Threat Mitigation.

Textbook

1. Thomas D. Nandeau and Ken Gray, “Software Defined Networks”, O’ Reilly Media, Inc., First Edition, 2013

FEI HU , “Network Innovation through OpenFlow and SDN: Principles and Design”, CRC Press, Taylor & Francis Group, 2014

CS454 Transaction Processing Systems

3-0-0-3

Objectives

- To knowhow in processing data generated by and about transactions that maintain high degree of accuracy and integrity
- To understand and recognize fraudulent transactions and produce timely user responses and reports

Outcomes

- Ability to develop solutions that addresses all of the information processes
- Ability to design and develop techniques where information systems shall meet emerging needs
- Ability to analyze situations, identify needs, propose and develop solutions

Unit – I

Consistency, Atomicity, Durability, Isolation, Flat Transactions, Providing Structure within a Transaction, Structuring an Application as Multiple Transactions.

Unit – II

Schedules and Schedule Equivalence, Recoverability, Cascaded Aborts and Strictness, Models for Concurrency Control, A Strategy for Immediate-Update Pessimistic Concurrency Controls, Design of an Immediate-Update Pessimistic Concurrency Control, Objects and Semantic Commutativity, Atomicity, Recoverability and Compensating Operations, Isolation in Structured Transaction Models, Conflicts in a Relational Database, Locking and the SQL Isolation Levels, Granular Locking: Intention Locks and Index Locks, Tuning Transactions, Multiversion Concurrency Controls.

Unit – III

Crash, Abort and Media Failure, Immediate-Update Systems and Write-Ahead Logs, Recovery in Deferred-Update Systems, Recovery from Media Failure.

Unit – IV

Transaction Processing in a Centralized System, Transaction Processing in a Distributed System, The TP Monitor: An Overview, Global Atomicity and the Transaction Manager, Remote Procedure Call, Pear-to-Pear Communication, Event Communication, Storage Architectures, Transaction Processing on the Internet, Implementing the ACID Properties, Atomic Termination, Transfer of Coordination, Distributed Deadlock, Global Serialization, When Global Atomicity cannot be Guaranteed, Replicated Databases, Distributed Transactions in the Real world.

Unit – V

Authentication, Authorization and Encryption, Digital Signatures, Key Distribution and Authentication, Authorization, Authenticated Remote Procedure Call, Electronic Commerce, The Secure Sockets Layer Protocol: Certificates, Passport: Single Sign-On, Keeping Credit Card Numbers Private, The Secure Electronic Transaction Protocol: Dual Signatures, Goods Atomicity, Certified Delivery, and Escrow, Electronic Cash: Blind Signatures.

Textbook

1. Michael Kifer, Arthur Bernstein and Philip M. Lewis, "Database Systems: An Application-Oriented Approach", Addison Wesley, 2006
2. Philip A. Bernstein and Eric Newcomer, "Principles of Transaction Processing", 2nd Edition, Morgan Kaufmann Publishers, Elsevier, 2009

CS455 Pervasive Computing

3-0-0-3

Objectives

- To understand the characteristics and principles of Pervasive computing and the solutions that are in use of everywhere computing and invisible computing
- To design and implement pervasive application that are embedded into cars, airplanes, ships, bikes, posters, signboards, walls and even clothes

Outcomes

- Ability to analyze and compare the performance of different data dissemination techniques
- Ability to develop solutions with comparisons for problems related to pervasive computing system through investigation

Unit – I Introduction

Pervasive Computing- Principles, Characteristics- interaction transparency, context aware, automated experience capture, Vision and challenges of pervasive computing, Pervasive computing infrastructure- Architecture for pervasive computing- Pervasive devices-embedded controls.- smart sensors and actuators -Context communication and access services

UNIT – II Technologies

Device Technology for Pervasive Computing : Hardware, Human-machine interfaces, Biometrics, Operating Systems, Java for pervasive devices- Voice Technology: Basics of Speech Recognition, Voice standards, Speech Applications, Speech and Pervasive Computing, Security-Personal Digital Assistants

UNIT – III Sensor Networks and RFID

Introduction to Sensor networks - Sensor Node Architecture – Sensor Network Architecture - Types of sensor networks – Platforms for Wireless sensor networks – Applications of Wireless Sensor networks - Introduction to RFID – transponder and reader architecture - Types of tags and readers - Frequencies of operation – Application of RFID Technologies.

UNIT – IV Web based Applications

Web application concepts for pervasive computing: History, WWW architecture, Protocols, Trans-coding, Client Authentication via the Internet for pervasive computing, XML and its rôle in Pervsive computing, WAP and beyond: Introduction, Components of the WAP architecture, WAP infrastructure, WAP security issues, Wireless Markup Language, WAP push, Products, i-Mode.

UNIT – V Programming And Applications

Server-side programming (Java) for pervasive computing: Java 2 Enterprise Edition (Overview), Servlets, Enterprise Java Beans, Java Server Pages, Extensible Markup Language, Web Services, Model-View-Controller pattern, Application Examples of Pervasive Computing: Retail, Airline Check-in and booking, Sales force automation, Healthcare, Tracking, Car Information Systems, Email Access via WAP and voice

Text Books

1. Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaec & Klaus Rindtorff: "Pervasive Computing: Technology and Architecture of Mobile Internet Applications", Pearson Education, New Delhi, Sixth Edition, 2009
2. Seng Loke, "Context-Aware Computing Pervasive Systems", Auerbach Pub., Taylor and Francis Group, New York, 2007
3. Rahul Banerjee, "Lecture Notes in Pervasive Computing", Outline Notes, BITS-Pilani, 2012.
4. Genco, S. Sorce, "Pervasive Systems and Ubiquitous Computing", WIT Press, 2012
5. Guruduth S. Banavar, Norman H. Cohen, and Chandra Narayanaswami, "Pervasive Computing: An Application-Based Approach", Wiley Interscience, 2012
6. Frank Adelstein, S K S Gupta, G G Richard, and L Schwiebert, "Fundamentals of Mobile and Pervasive Computing", Tata McGraw-Hill, New Delhi, 2005
7. Stefen Poslad, "Ubiquitous Computing: Smart Devices, Environments and Interactions", Wiley, Second Edition, 2010

CS456 Programming for Multi-Core Systems

3-0-0-3

Objectives

- To understand the fundamentals of multi-core architecture
- To be able to know the basic concepts of multi core programming using threads
- To be able to understand various programming constructs in multi-core architecture

Outcomes

- Ability to exploit the benefit of parallel programming
- Ability to design and develop APIs for Multithreaded Applications

Unit – I Fundamentals of Multi core

Fundamentals of Quantitative Design and Analysis-Dependability-Measuring, Reporting and Summarizing Performance-Quantitative principles of computer Design, Instruction Level Parallelism-Data level and Thread level Parallelism. Multi core Architecture-Motivation for Concurrency -Parallel Computing in Micro processors-Gustafson's law

Unit – II Introduction to Threads

Defining threads-System View of threads-Threading above the OS-Inside the OS-Threads inside the Hardware-What happened When a thread is created-Application Programming models and threading-VMs and Platforms-Run time Virtualization, System Virtualization.

Unit – III Thread Programming Types and APIs

Synchronization-Critical Section-Deadlock-Synchronization Primitives-Semaphores-Locks-Condition Variables-Flow Control based Concepts-Implementation based Threading Features-Threading APIs for Microsoft Windows-Threading API for .NET framework, POSIX Threads-Programming With Pthreads, OpenMP-Challenges in threading a loop-Minimizing threading overhead-Performance oriented programming- JavaThreads

Unit – IV Thread Handling and Debugging

Too many threads-Data Races, Deadlock and Live locks-Heavily Contended Locks-Non-blocking algorithms-Thread safe functions and libraries-Memory Issues –Cache Related Issues-Avoiding Pipeline Stalls in IA-32-Data Organization for High Performance, Multithreaded Debugging Techniques: General Debugging Techniques

Unit – V Implementation of the Programming Constructs

Foundations of Shared Memory, Spin Locks and Contention- Monitors and Blocking Synchronization- Concurrent Queues and the ABA Problem- Concurrent Stacks and Elimination-Counting, Sorting, and Distributed Coordination Concurrent Hashing and Natural Parallelism-Skip lists and Balanced Search- Futures, Scheduling, and Work Distribution- Barriers-Transactional Memory **-** Software Transactional Memory-hardware Transactional Memory – Threading on Intel Multicore Processors.

Text Books

1. Shameem Akhter and Jason Roberts, "Multi-Core Programming: Increasing Performance through Software Multi Threading", Intel Press, 2006
2. Maurice Herlihy and Nir Shavit, "The Art of Multiprocessor Programming", Revised First Edition, Elsevier Publication, 2012

Reference Books

1. John L. Hennesy, and David E. Patterson, "Computer Architecture: A Quantitative Approach", 5th Edition, Elsevier Publication, 2012
2. Thomas Rauber and Gudula Rünger, "Parallel Programming: for Multi-core and Cluster Systems" , 2nd Edition, Springer Publication, 2010

CS457 Soft Computing

3-0-0-3

Objectives

- To understand the concepts of feed forward & feedback neural networks
- To understand the concept of fuzziness involved in various systems
- To expose the ideas about genetic algorithm
- To provide adequate knowledge about of FLC and NN toolbox

Outcomes

- Ability to use the concepts of machine learning and soft computing techniques in solving real world applications
- Ability to make use of MATLAB in solving soft computing techniques

Unit – I

Introduction of soft computing - soft computing vs. hard computing- various types of soft computing techniques- applications of soft computing-Neuron- Nerve structure and synapse-Artificial Neuron and its model- activation functions- Neural network architecture- single layer and multilayer feed forward networks- McCullochPitts neuron model- perceptron model-Adaline and Madaline- multilayer perception model- back propogation learning methods- effect of learning rule coefficient -back propagation algorithm- factors affecting back propagation training- applications.

Unit – II

Counter propagation network- architecture- functioning & characteristics of counter-Propagation network-Hopfield/ Recurrent network- configuration- stability constraints-associative memory- and characteristics- limitations and applications- Hopfield v/s Boltzman machine- Adaptive Resonance Theory- Architecture- classifications-Implementation and training-Associative Memory

Unit – III

Counter propagation network- architecture- functioning & characteristics of counter-Propagation network-Hopfield/ Recurrent network- configuration- stability constraints-associative memory- and characteristics- limitations and applications- Hopfield v/s Boltzman machine- Adaptive Resonance Theory- Architecture- classifications-Implementation and training-Associative Memory

Unit – IV

Basic concept of Genetic algorithm and detail algorithmic steps-adjustment of free Parameters-Solution of typical control problems using genetic algorithm- Concept on some other search techniques like tabu search and ant colony search techniques for solving optimization problems.

Unit – V

GA application to power system optimization problem- Case studies: Identification and control of linear and nonlinear dynamic systems using Matlab-Neural Network toolbox. Stability analysis of Neural Network interconnection systems- Implementation of fuzzy logic controller using Matlab fuzzy logic toolbox-Stability analysis of fuzzy control systems

Text Books

1. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Wiley India, 3rd edition, 2012
2. Zimmermann H. J. "Fuzzy set theory and its Applications" Springer international edition, 2011
3. David E. Goldberg, “Genetic Algorithms in Search, Optimization, and Machine Learning”, Pearson Education, 2009
4. Laurene V. Fausett, “Fundamentals of Neural Networks: Architectures, Algorithms, And Applications”, Pearson Education, 1st edition, 1993
5. W. T. Miller, R. S. Sutton and P. J. Webros, “Neural Networks for Control”, MIT Press, 1996

CS458 Digital System Testing and Verification

3-0-0-3

Objectives

- To design the Models at various levels and detects the faults in modeling
- To learn the testability techniques and to learn the Verilog for building the systems
- To test and verify the validity of the Model

Outcomes

- Ability to design the modeling of systems
- Ability to write the test bench to test the validity of the model
- Ability to write Verilog code to built the systems

Unit I

Modeling : Basic Concepts, Functional Modeling at the Logic Level, Functional Modeling at the Register Level, Structural Models, Level of Modeling, Logic Simulation: Problems in simulation-Based Design Verification, Types of Simulation, The Unknown Logic Value, Compiled Simulation, Event Driven Simulation, Delay Models, Element Evaluation, Hazard Detection, Gate Level Event-Driven simulation, Other Logic Values, Other Delay Models.

Unit II

Fault Modeling : Logical Fault Models, Fault Detection and redundancy, Fault Equivalent and Fault Location, Fault Dominance, The single Stuck-Fault Model, The Multiple Stuck Fault-Model, Stuck RTL Variable, Fault Variables. Fault Simulation : General Fault Simulation Techniques, Fault Simulation for Combinational Circuits, Fault Sampling, Statistical Fault analysis.

Unit III

Testing for Bridging Fault: The Bridging Fault Model, Detection of Non-feedback Bridging Faults, Detection of Feedback Bridging Faults, Bridging Fault Simulation, Test Generation for Bridging Faults. Functional Testing : Functional Testing without Fault Models, Exhaustive and Pseudo exhaustive Testing, Functional Testing with Specific Fault Models,

Unit IV

Design for Testability : Testability, Ad Hoc Design for Testability Techniques, Controllability and Observability by means of Scan Registers, Generic Scan-Based Designs, Storage cells for Scan designs, Classical scan designs, Scan Design Costs, Board level and system level DFT Approaches, Advanced scan concepts, Boundary Scan Standards.

Unit V

Basics of Test and Role of HDLs : Design and Test, Test Concerns, HDLs in Digital System Test. Verilog HL for Design and Test : HDL for developing test methods, Using verilog in design, Using verilog in test, Basic structures of verilog, Combinational Circuits, Sequential circuits. Fault and detectiona modeling using verilog

Text Books

1. Zainalabedin Navabi, "Digital System Test an Testable Desin using HDL Models and Architectures", Springer publications, 2010.
2. Miron Abramovici, Melvin A. Breuer, and Arthur D. Friedman, "Digital Systems Testing and Testable Design", Wiley publications1990.

Reference Book

- Jha, Niraj K., and Sandeep Gupta, "Testing of digital systems", Cambridge University Press, 2003.

CS459 CAD for VLSI

3-0-0-3

Objectives

- To provide experience designing integrated circuits using Computer Aided Design (CAD) Tools
- To introduce the concepts and techniques of modern integrated circuit design and testing (CMOS VLSI)
- To understand the programming paradigms of Hardware Description language (HDL)

Outcomes

- Ability to acquire hands-on skills of using CAD tools in VLSI design
- Ability to design and develop VLSI project having a set of objective criteria and design constraints.

Unit I

Introduction to CAD tools, Evolution of Design Automation, Basic Transistor Fundamentals, CMOS realizations of basic gates.

Unit II

Modelling techniques, Types of CAD tools and Introduction to logic simulation

Unit III

Verilog: Syntax, Hierarchical modelling and Delay modelling, Verilog constructs, Memory modelling

Unit IV

Logic Synthesis: Introduction synthesis of different Verilog constructs.

Unit V

Introduction to Reconfigurable computing, FPGAs, the Altra Quartus II flow.

Text Books

1. Samir Palnitkar, “Verilog HDL”, 2nd Edition, Pearson Education, 2004.
2. J. Bhaskar, “Verilog HDL Synthesis”, BS publications, 2001

CS460 Middleware Technologies

3-0-0-3

Objectives

- To understand the essence of client-server and middleware architectures
- To learn the basics of CORBA and C#.NET technologies

Outcomes

- Ability to comprehend of Middleware tools
- Ability to build real time applications based on .Net and C#

Unit – I

Introduction to client server computing- client server models, Benefits of client server computing, pitfalls of client server programming, Middleware − Client / server building blocks, RPC, RMI

Unit – II

Middleware – Objects, Elements, Architecture, Middleware distributed applications, middleware types, transaction oriented middleware

Unit – III

CORBA with Java **-** Client/Server CORBA-style, The object web CORBA with Java, The static CORBA, first CORBA program, ORBlets with Applets, Dynamic, CORBA Beans, CORBA initialization protocol, CORBA activation services, CORBA java- to- IDL mapping

Unit – IV

EJBs and CORBA **-** Object transaction monitors CORBA OTM's, EJB and CORBA OTM's, EJB container frame work, Session and Entity Beans, The EJB client/server development Process The EJB container protocol, support for transaction EJB packaging EJB design Guidelines.

Unit – V

Introducing C# and the .NET Platform**-** Understanding .NET Assemblies, Object Oriented Programming with C#, Callback Interfaces, Delegates, and Events, Type Reflection, Late Binding, and Attribute-Based Programming, Object Serialization and the .NET Remoting Layer

Text Books

1. Robert Orfali, Dan Harkey, and Jeri Edwards, "The Essential Client/Server Survival Guide", John Wiley & Sons , 3rd Edition, 1999
2. Robert Orfali and Dan Harkey, "Client/Server programming with Java and CORBA", John Wiley & Sons , SPD 2nd Edition, 1998
3. Chris Britton, "IT Architectures and Middleware: Strategies for Building Large, Integrated Systems", Pearson Education, 2nd Edition , 2004

Reference Books

1. Jesse Liberty, "Programming C#", 2nd Edition, O'Reilly Press, 2002
2. Andrew Troelsen, "C# and the .NET Platform", Apress Wiley-Dreamtech, India Pvt Ltd, 2nd Edition, 2007