NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR

Hazratbal, Srinagar, Kashmir, 190 006. India

BATCH 2014 ONWARDS

COURSES & SYLLABI

Computer Science & Engineering

Introduction

The Department of Computer Science & Engineering started functioning from 2007. It offers four year B.Tech degree course in Computer Science & Engineering. The initial intake in 2007 was 40 and now it is 60. The degree is awarded after completion of a minimum of 200 credits. Common courses for 50 credits are offered to students of all branches in a common first year spread over 2 semesters. Courses for the remaining 150 credits are offered to students during a span of three years spread over 6 semesters.

The first Board of Studies (BoS) meeting of the B.Tech Computer Science & Engineering Course was held in May 2008. In the meeting courses to be taught at 3rd and 4th Semester level were only approved. The second Board of Studies (BoS) was held on November 2009. The third BOS was held on 16-06-2014 and fourth BOS on 06-03-2015. In this meeting, course scheme of B.Tech Computer Science & Engineering degree course from 3rd to 8th Semesters was prepared, examined, revised, formulated and approved for batch starting from 2014. The scheme of courses has been designed such that at least 50% of the courses are offered by Department of Computer Science & Engineering. The remaining 50% courses are interdisciplinary and are offered by Departments of Information Technology, Department of Electronics & Communication Engineering, Electrical Engineering, Mathematics and Humanities Departments.

Other main features of the scheme are:-

1. Courses offered are either 2 credit, 3 credit or 4 credit
2. One hour lecture/tutorial has been assigned 1 credit weightage
3. Two hour laboratory per week has also been assigned 1 credit weightage
4. A continuous evaluation scheme is used to evaluate the students for each course. The evaluation is as under:

Minor Exam I	20 marks
Minor Exam II	20 marks
Class Assessment	10 marks
Major Exam	50 marks

5. Grades are allotted to the students as per the following scheme:

Marks	Grades	Points
0 to 39	F	4
40 to 50	C	5
51 to 60	C+	6
61 to 70	B	7
71 to 80	B+	8
81 to 90	A	9
91 to 100	A+	10

6. At the end of each semester a cumulative grade point average (CGPA) is calculated for the courses taken by a student.

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Computer Science & Engineering Department

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Course Structure for B.Tech. Computer Science & Engineering

(Batch 2014 onwards)

Semester: 2nd (For all branches of Engineering)

S.No.	Subject	Code	L	T	P	Credits
1	Computer Programming	CSE 201	3	0	0	3
2	Computer Programming Lab	CSE 202 P	0	0	2	1

Semester: 3rd

S.No.	Subject	Code	L	T	P	Credits
1	Object Oriented Programming	CSE 301	3	1	0	4
2	Object Oriented Programming -Lab	CSE 302 P	0	0	2	1
3	Internet & Web Technologies	IT 302 P	0	0	4	2
4	Signals & Systems	ECE 303	3	1	0	4
5	Basic Electronics	ECE 302	3	1	0	4
6	Basic Electronics Lab	ECE 303 P	0	0	2	1
7	Basic Electrical Engineering	ELE 307	3	1	0	4
8	Basic Electrical Engineering- Lab	ELE 308 P	0	0	2	1
9	Discrete Mathematics	MTH 309	3	1	0	4
	Total Credits					**25**

Semester: 3rd - Other Department Courses - Information Technology

S.No.	Subject	Code	L	T	P	Credits
1	Object Oriented Programming	CSE 301	3	1	0	4
2	Object Oriented Programming -Lab	CSE 302 P	0	0	2	1

Semester: 4th

S.No.	Subject	Code	L	T	P	Credits
1	Data Structures	CSE 401	3	1	0	4
2	Data Structures – Lab	CSE 402 P	0	0	2	1
3	Introduction to Probability Theory & Statistics	MTH 403	3	0	0	3
4	Digital Electronics & Logic Design	ECE 403	3	1	0	4
5	Digital Electronics & Logic Design – Lab	ECE 404 P	0	0	2	1
6	Software Engineering	IT 401	3	1	0	4
7	Communication Systems	ECE 408	3	1	0	4
8	Communication Systems – Lab	ECE 409 P	0	0	2	1
9	Control Systems	ELE 407	3	0	0	3
	Total Credits					**25**

Semester: 4th - Other Department Courses - Information Technology

S.No.	Subject	Code	L	T	P	Credits
1	Data Structures	CSE 401	3	1	0	4
2	Data Structures –Lab	CSE 402 P	0	0	2	1

Semester: 5th

S.No.	Subject	Code	L	T	P	Credits
1	Computer Organization & Architecture	CSE 501	3	1	0	4
2	Design & Analysis of Algorithms	CSE 502	3	1	0	4
3	Microprocessor	CSE 503	3	0	0	3
4	Microprocessor - Lab	CSE 504 P	0	0	2	1
5	Operating Systems	CSE 505	3	1	0	4
6	Data Base Management Systems	CSE 506	3	1	0	4
7	Data Base Management Systems - Lab	CSE 507 P	0	0	2	1
8	Data Communication	CSE 508	3	1	0	4
	Total Credits					**25**

Semester: 5th - Other Department Courses

- Electronics & Communication Engineering

S.No.	Subject	Code	L	T	P	Credits
1	Data Structures	CSE 509	3	1	0	4
2	Data Structures Lab	CSE 510 P	0	0	2	1

- Information Technology

S.No.	Subject	Code	L	T	P	Credits
1	Design & Analysis of Algorithms	CSE 502	3	1	0	4

Semester: 6th

S.No.	Subject	Code	L	T	P	Credits
1	Artificial Intelligence	CSE 601	3	1	0	4
2	Artificial Intelligence - Lab	CSE 602P	0	0	2	1
3	Computer Networks	CSE 603	3	1	0	4
4	Computer Networks - Lab	CSE 604 P	0	0	2	1
5	Theory of Computation	CSE 605	3	1	0	4
6	Computer Graphics	CSE 606	3	1	0	4
7	Computer Graphics -Lab	CSE 607 P	0	0	2	1
8	Java Programming	CSE 608	2	0	2	3
9	Elective I	CSE EXX	3	0	0	3
	Total Credits					**25**

Semester: 7th

S.No.	Subject	Code	L	T	P	Credits
1	Compiler Design	CSE 701	3	0	0	3
2	Compiler Design - Lab	CSE 702 P	0	0	2	1
3	Network Security	CSE 703	3	1	0	4
4	Network Security - Lab	CSE 704 P	0	0	2	1
5	Pre-Project	CSE 705	0	0	6	3
6	Seminar	CSE 706	0	0	2	1
7	Elective II	CSE EXX	3	0	0	3
8	Elective III	CSE EXX	3	0	0	3
9	Elective IV	CSE EXX	3	0	0	3
10	Operations Research & Optimization	MTH 715	3	0	0	3
	Total Credits					**25**

Semester: 7th - Other Department Courses

- Electronics & Communication Engineering (M.Tech.)

S.No.	Subject	Code	L	T	P	Credits
1	Internet & Web Design	CSEM 108	1	0	2	2
2	RDBMS	CSEM 109	2	0	2	3

- Information Technology (Elective)

S.No.	Subject	Code	L	T	P	Credits
1	Compiler Design	CSE 701	3	0	0	3
2	Compiler Design - Lab	CSE 702 P	0	0	2	1

Semester: 8th

S.No.	Subject	Code	L	T	P	Credits
1	Project	CSE 801	0	0	12	12
2	Elective V	CSE EXX	3	0	0	3
3	Elective VI	CSE EXX	3	0	0	3
4	Elective VII	CSE EXX	3	0	0	3
5	Practical Training & Tour	CSE 808		-		1
6	Industrial Organization & Management	HSS 801	3	0	0	3
	Total Credits					**25**

List of Electives

S.No.	Subject	Code
1.	Simulation & Modeling	CSE E01
2.	Graph Theory	CSE E02
3.	Digital Signal Processing	CSE E03
4.	Multimedia Technology	CSE E04
5.	Logic Programming	CSE E05
6.	Embedded Systems	CSE E06
7.	Advanced Java & Android Programming	CSE E07
8.	System on Chip (SoC)	CSE E08
9.	Advanced Internet Technologies	CSE E09
10.	Wireless Communication	CSE E10
11.	Fault Tolerant Computing	CSE E11
12.	Image Processing	CSE E12
13.	System Design using HDL	CSE E13
14.	Real Time Systems	CSE E14
15.	Unix & Shell Programming	CSE E15
16.	High Speed Networks	CSE E16
17.	Advanced Algorithms	CSE E17
18.	Reconfigurable Computing	CSE E18
19.	Computer Vision	CSE E19
20.	Advanced Computer Networks	CSE E20
21.	Advanced Computer Graphics	CSE E21
22.	Advanced DBMS	CSE E22
23.	Advanced Computer Architecture	CSE E23
24.	Advanced Compilation Techniques	CSE E24
25.	Principles of Cryptography	CSE E25
26.	Neural Network	CSE E26
27.	Pervasive Computing	CSE E27
28.	Distributed and Parallel Computing	CSE E28
29.	Cloud Computing	CSE E29
30.	Software Project Management	CSE E30
31.	Big Data	CSE E31
32.	Cyber laws and Forensics	CSE E32
33.	Expert Systems	CSE E33
34.	Mobile Computing	CSE E34
35.	Green Computing	CSE E35
36.	Numerical Methods	MTH 707
37.	Advanced Java	CSEM 208

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2nd Semester

Computer Science & Engineering

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Subject	: Computer Programming
Semester	: 2nd
Department	: Computer Science and Engineering
Course No.	: CSE 201
Credits	: 3
L T P	: 3 0 0

Course Details:

Introduction to C Programming: Engineering problem solving methodology, Flow charts, Tracing flow charts, Algorithms, Need for computer Languages, computer languages, High-level languages , History of C, A simple C Program.

C Language preliminaries: Program structure, C character set, Identifiers and keywords, Data types, Declarations, Expressions, statements symbolic constants, Library functions, pre-processors,#include, #define

Input-Output: getchar, putchar, scanf, printf, gets, puts and other related input output functions.

Operators and expressions: operators in C,Arithmetic ,unary, logical, bit-wise, assignment and conditional operators.

Control statements: if else, switch, break, Continue, and goto statements,
While, do-while, for statements, nested loops, loops using goto. comma operators and variants of above control structure.

Functions: Defining and accessing, passing arguments, Function prototypes, Recursion, Library functions, Static functions

Arrays: Defining and processing, Passing arrays to a function, matrices as 2D arrays ,Multi dimensional arrays.

Pointers: Declarations, Passing pointers to a function, Operations on pointers, Pointer Arithmetic, Pointers and arrays, Arrays of pointers and function pointers. Dynamic memory allocation of arrays and higher dimensional arrays using malloc() function.

Strings Fundamentals: of character and strings, string handling library functions , pointer to strings, dynamic allocation for strings.
File Handling : Files, ascii files , binary files,File operation such as storing , retrieving and updating a file.

Text Books:

1. Schaums outline of Theory and Problems of programming with C : Gottfried
2. Mastering C by Venugopal, Prasad – TMH
3. Programming in ANSI C, Balaguruswamy

Other Books Recommended:

1. Complete reference with C Tata McGraw Hill
2. Engineering Problem Solving with ANSI C, Delores M. Etter, Prentice Hall
3. C Programming, Ivor Horton, Wrox Press Limited
4. The C programming language : Kerninghan and Ritchie

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Subject	: Computer Programming Lab
Semester	: 2nd
Department	: Computer Science and Engineering
Course No.	: CSE 202 P
Credits	: 1
L T P	: 0 0 2

Lab Details:

1. Programs to understand how integers, characters, and strings are stored and represented in C
2. Programs to understand the ASCII character encoding
3. Programs to understand how to use different operators available in C.
4. Programs to understand differences between a logical and arithmetic operators
5. Programs to understand differences between a logical and bitwise operators
6. Programs to obtain a full understanding of signed , unsigned, long and short numbers in C.
7. Programs to understand exactly how numbers are represented in computers(octal, hexadecimal and binary numbers systems)
8. Programs to evaluate algebraic expressions in C.
9. Programs to understand printing of message on output screen.
10. Programs to understand printing of various data types using different output functions.
11. Programs to exercise all flags in printf() functions
12. Programs to understand printing of display patterns of numbers and asterisks.
13. Programs to understand taking input from user using different input functions.
14. Programs to exercise all flags in scanf() functions
15. Programs to understand how arrays work in C, how to use them, and how they are stored in memory
16. Programs to understand searching in an array.
17. Programs to understand sorting techniques using arrays.
18. Programs to understand pointers in C.
19. Programs to understand the relationship between array indexing and pointer arithmetic.
20. Programs to understand dynamic memory allocation especially with respect to 1D and 2D arrays.
21. Programs to understand modularize of code using functions.

22. Programs to implement function with\without arguments and with\without return types.
23. Programs to understand direct and indirect recursions using functions.
24. Programs to use pointer to pass the address of data and arrays to functions.
25. Programs to understand static data types and static functions.
26. Programs to understand creating, accessing and using structures.
27. Programs to understand use of arrays of structures.
28. Programs to understand pointers to structures and pointers as structures members.
29. Programs to understand creating, reading, writing a file.
30. Programs to understand taking input through arguments to main() function.

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Detailed Syllabus

Semester 3rd

Computer Science & Engineering

Subject	: Internet and Web Design
Semester	: 3rd
Department	: Department of Information Technology
Course No.	: IT 301 P
Credits	: 2
L T P	: 0 0 4

HTML & Introduction to CSS

HTML for structure, CSS for layout, and JavaScript for client-side programming; Suggestions for learning. Web Site Basics: Dreamweaver, HTML: Elements. Attributes and values.HTML Tables: Table, heading, row, data elements and attributes. Table structure not for page layout.Links and server-side includes: HTML links and anchors. Linking to external files to modularize html, build script libraries, or share styles; Server-side Includes. Standards: W3C, the World Wide Web Consortium: W3C recommendations as standards.HTML rules: Extensible markup languages; Frames: A glance at a common but deprecated element; advantages and disadvantages; frame and frameset properties. Images: Image types (JPG, GIF, PNG). Inline, embedded, and external styles. Writing Style Rules: Writing CSS selectors and rules to tie style attributes and values to html elements. The cascade: Inheritance, specificity, and the cascade.CSS positioning: Static, relative, and absolute positioning.

Introduction to JavaScript:

Client-side programming for browsers. Event Handlers. JavaScript Overview: Language characteristics. Variables. Assignment and comparison operators; expressions.HTML Forms: The form element and inputs: textbox, radio buttons, checkbox, textarea.

Advanced HTML & CSS:

HTML Form Basics, JavaScript, JavaScript Functions: Writing blocks of separate, reusable code, Getting started with developing simple functions for form validators. Form Validation: JavaScript for Simple Form Validation, The DOM and JavaScript Object Models: The W3C Document Object Model; using nodes; DHTML: JavaScript + CSS = Dynamic HTML, Advanced form validation: Javascript's innerHTML and dynamic CSS for advanced form validation

JavaScript Programming

Tracking the Mouse: Reporting the x and y position of the mouse, Annotating text: Adding hidden text and accessing through JavaScript, Advanced JavaScript—Super Hypertexts: Finding. JavaScript's Built-in Objects: Arrays. Dates. Math. Number and String Objects, Web Site Design / Redesign: Overview of site redesign. Client survey.

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Subject	: Object Oriented Programming
Semester	: 3rd
Department	: Computer Science & Engineering
Course No.	: CSE 301
Credits	: 4
L T P	: 3 1 0

Course Details:

Introduction: Basic features & concepts of Object Oriented Programming (OOP), Benefits, Languages and Applications of OOPs.

Tokens, Expressions and Control Structures: Tokens, Keywords, Identifiers & Constants, Basic Data types, User-defined Data types, Derived Data Types, Memory Management Operators, Manipulators, Expressions, Operator Overloading, Control Structures

Functions in C++: Main function, function prototyping, call by reference, inline functions, default functions, function overloading.

Classes and Objects: Specifying a class, defining member functions, private member functions, array within a class, memory allocation for objects, arrays of objects, objects as function arguments, returning objects, pointers to members, local classes.

Constructors & Destructors: Constructors, Parameterized Constructors, Constructors with Default arguments, Dynamic Initialization of objects, Dynamic Constructors & Destructors

Operator Overloading & Type Conversion: Definition & Rules of overloading Operators, Overloading Binary & Unary Operators. **Inheritance:** Definition, single, multilevel, multiple, hierarchical and hybrid inheritance, virtual base classes, abstract classes

Pointers, Virtual Functions and Polymorphism: Pointers, Pointers to Objects and derived classes, virtual functions, Pure virtual functions.

Templates: Class templates, function templates, overloading of function templates, member function templates. **Strings:** Creating and manipulating string objects, accessing characters in strings, comparing and swapping

Books recommended:

1. Object Oriented Programming with C++, **E Balagurusamy**
2. Object Oriented Programming in Turbo C++, **Robert Lafore**
3. Teach Yourself C++, **Al Stevens**
4. A Structured Approach using C++, **Farouzan & Gilberg**
5. Object Oriented Programming with C++, **R S Salaria**

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Subject	: Object Oriented Programming Lab
Semester	: 3rd
Department	: Computer Science & Engineering
Course No.	: CSE 302 P
Credits	: 1
L T P	: 0 0 2

Lab Details:

1. Function overloading, default arguments in C++

2. Simple class design in C++, namespaces, objects creations

3. Class design in C++ using dynamic memory allocation,

4. Destructor, copy constructor

5. Operator overloading, friend functions

6. Overloading assignment operator, type conversions

7. Inheritance, run-time polymorphism

8. Template design in C++

9. Interfaces and Inheritance

10. Exceptions handling

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Subject	: Signals and Systems
Semester	: 3rd
Department	: Department of Information Technology
Course No.	: IT 305
Credits	: 4
L T P	: 3 1 0

Course Details:

Introduction to signals: Classification of signals; Deterministic and non-deterministic, periodic and aperiodic, even and odd signals, energy and power signals, elementary signals; exponential, sinusoidal, impulse, step, ramp, pulse, square wave signals. Time shifting, time scaling and time-inversions of signals

Linear Time invariant systems: Continuous time system, basic system properties like causality, time invariance, stability, linearity, memory, order of system, interconnection of systems, Linear time invariant systems, characterization, unit impulse response , convolution, properties of LTI systems, linear constant co-efficient differential equations and system description.

Fourier analysis of signals and systems: Fourier series of periodic signals and its properties, Fourier transform of aperiodic signals and its properties, fourier transform of periodic signals, convolution in time and frequency domain, energy and signals, parsevals theorem, energy spectral density and its properties, Transfer function of LTI system

The Laplace Transform: Definition, relation between Laplace and Fourier transforms, region of convergence, properties of Laplace transform, initial and final value theorems, convolution, transfer function of LTI system, concept of poles and zeroes, stability criteria

Random variable theory and random signals: Probability, conditional probability, statistical independence, random variables, discrete and continuous random variables, probability distribution and probability density functions, statistical averages of random variables. Some important density functions.

Random processes and characterization: Ensemble and time averages, stationary and non-stationary random process, wide sense stationery random process, autocorrelation and cross-correlation functions, response of LTI systems to random inputs, noise and its types, white noise, signal to noise ratio of LTI systems.

Books Recommended:

(1) Signals and Systems by Zieman, Tranter, Fannin
(2) Signals and Systems by Sanjay Sharma
(3) Signals and Systems by A Populis
(4) Random processes and Systems by A Populis
(5) Signals and Systems by S. Hykin

Subject	: Basic Electronics
Semester	: 3rd
Department	: Electronics and Communication Engineering
Course No.	: ECE 302
Credits	: 4
L T P	: 3 1 0

Course Details:

Introduction to Semiconductors: Intrinsic and extrinsic semiconductors transport mechanism of charge carriers, electric properties, Hall effect etc. Electronic Devices, their characteristics and applications, p-n junction diode. Current components in p-n junction, characteristics-piece wise linear approximation, temperature dependence, Diode capacitance, and switching times, diode circuits half wave, full wave rectifiers, clipping circuits etc. Basic operations of Zener, avalanche, schottky photo and tunnel diodes.

BJT's : Types operation and characteristics, Ebers-Moll model, CE, CB and CC configuration input, output characteristics and graphical analysis of basic amplifier circuits, Biasing and Bias stability, Low frequency, h-parameter model, Analysis and Design of transistor amplifier circuits using h parameters. High frequency hybrid – pi model, analysis and design of transistor amplifier circuits at high frequencies. Multistage amplifiers, phototransistors, Transistor as a switch, SCR's and Thyistors.

FET's: Operation and characteristics, model Application at low and high frequency, amplifiers, switching circuits, MOSFEET TYPES, Operation and characteristics.

Cathode Ray Oscilloscope,Basic operation and measurement applications.

Books Recommended:

1. Electronic circuits by D Schelling & C Belove
2. Integrated Electronics by Millman & Halkias
3. Basic Electronics by Grob 10/e
4. Basic Electronics by Mitehel E Schultz TMH

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Subject			:	Basic Electronics Lab	
Semester			:	3rd	
Department			:	Electronics and Communication Engineering	
Course No.			:	ECE 303 P	
Credits			:	1	
L	**T**	**P**	:	0	0	2

Lab Details:

1. Study of CRO - Measurement of Voltage frequency and Phase of a given waveform.
2. To assemble RC circuits and observe its performance in low pass and high pass mode.
3. To assemble a series and parallel resonant circuit and observe their frequency response.
4. To measure impedance and bandwidth of a parallel tuned circuit and obtain its quality factor.
5. To measure characteristic impedance and image impedance of a symmetrical Tee and Pi networks.
7. For a given two port network measure: ABCD parameters and h - parameters.
8. To experimentally determine the characteristic impedance and to plot the attenuation characteristics of the following circuits: Prototype low pass filter and Prototype high pass filter. To plot impedance and attenuation characteristics of following filters: Prototype band-pass filter, m-derived LPF and m-derived HPF
10. To obtain diode characteristics. To assemble a half wave and a full wave rectifier and to study their performance, To suppress the ripple using RC filter.
12. To obtain Zener diode characteristics and to use Zener diode as a voltage regulator
13. To assemble and observe the performance of clipping and clamping circuits.
14. To obtain transistor characteristics in the following configurations: Common base and Common emitter
15. To assemble a CE amplifier and observe its performance.
16. To obtain JFET characteristics and to observe performance of a source follower.To illustrate use of FET as a voltage variable resistor

Subject	: Basic Electrical Engineering
Semester	: 3rd
Department	: Electrical Engineering
Course No.	: ELE 307
Credits	: 4
L T P	: 3 1 0

Course Details :

Electric Circuit Laws: Basic electric circuit terminology, Ohm's law, Kirchhoff's current law. (KCL) and Kirchhoff's voltage law (KVL) circuit parameters (Resistance, Inductance and capacitance). Series and Parallel combinations of resistance, Inductance and capacitance, Nodal analysis.

Energy Source: Ideal and practical voltage and current sources and their transformation.

Dependent Sources: Dependent voltage sources and dependent current sources.

D.C. Circuit Analysis: Power and energy relations, Analysis of series parallel d.c. circuits, Delta star (Y) Transformation, Loop and Nodal methods, Thevenin's, Norton's theorem, Maximum Power transfer theorem, Superposition theorem.

A.C. Circuit Analysis: Basic terminology and definitions, Phasor and complex number representations, solutions of sinusoidal excited, RC circuits, power and energy relations in a c circuits, Applications of network theorems to a.c. circuits, Resonance in series and parallel circuits.

Steady State A.C. Three phase Circuits: Concept of a 3 phase voltage, wye (Y -) circuits. Delta circuits, current and voltage relations in Y and Circuits, characteristics of 3 phase systems.

Magnetically Coupled Circuits : Mutual inductance, Theory of magnetic circuits and electromagnetism. Transformers.

Books Recommended

1. Basic Electrical Engineering by Fitzgerald

2. Electrical Engineering Fundamentals by V. Del Toro

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Subject	: Basic Electrical Engineering Lab
Semester	: 3rd
Department	: Electrical Engineering
Course No.	: ELE 308 P
Credits	: 1
L T P	: 0 0 2

Lab Details:

1. To study the colour coding of resistors
2. Connection of Ammeters, Voltmeters, Wattmeters and multi-meters in DC and AC circuits and selection of their ranges.

3 Use of LCRQ meter.

4. To study the series / parallel operation of resistors and verifying their effective values by LCRQ meter.

5 To verify the KVL and KCL in DC circuits.

6 To verify the star delta transformation of networks.

7 To verify the superposition theorem.

8 To verify the maximum power transfer theorem

9 Basic R, L, C circuits excited from A.C

10 To measure electric power in single-phase AC circuits with resistive load, RL load and RLC load.

11 To measure the power and power factor in three phase AC circuits.

12 To study the series resonance.

13 To study the parallel resonance.

14 To study the handling of CRO and use it for the study of different voltage waveforms.

15 Computer Aided Circuit Analysis (3 experiments)

Subject	: Discrete Mathematics
Semester	: 3rd
Department	: Mathematics
Course No.	: MTH 309
Credits	: 4
L T P	: 3 1 0

Course Details:

Unit I

Relations: Sets, Product sets, Relations, Representation of Relations, Composition of Relations, Partitions, Equivalence Relations.

Unit II

Ordered sets and Lattices: Ordered sets, Diagram of Partially ordered sets, Supremum and Infimum, well ordered sets, Lattices, Bounded and complemented lattice, Distributive Lattice.

Unit III

Propositional Calculus: Statements, Basic operations, Truth value of compound statements, Algebra of Propositions, Tautologies and contradiction, Conditional and Bi-conditional statements, logical implications, logical equivalence, predicates, Universal and existential quantifiers.Logic gates, Boolean Algebra, Postulates of Boolean Algebra; Theorems of Boolean Algebra, Sum of products and product of sums Simplification, NAND and NOR implementation.

Unit IV

Graph Theory: Graphs and Multi-graphs, Degree of a vertex, Paths connectivity, Cut points Bridges, Walks, paths, cycles, connected graphs, Bipartite, Regular,Planar and connected graphs,Components, Euler graphs, Euler's theorem, Hamiltonian path and circuits, Graph coloring, chromatic number, isomorphism and Homomorphism of graphs,Konigsberg seven bridge problem, Shortest path. Trees, properties of trees, pendant vertices in trees, Degree sequences in trees, Necessary and sufficient conditions for a sequence to be a degree sequence of a tree.

Unit V

Group Theory: Groups, semi group, infinite group, Finite group, order of a group, Abelian group, subgroup, Necessary and sufficient condition for a subset to be a subgroup of a group, Lagrange's Theorem, Cosets, Normal Subgroups, order of an element of a group, cyclic group. Rings , Homomorphism and Isomerphism of rings.

Books Recommended

1. C. L. Liu : Elements of Discrete Mathematics, 2nd Ed.Tata Mc-Graw Hill.
2. Kolman, Busby and Ross : Discrete Mathematical Structers, 6th Ed.PHI (2009).
3. Narsingh Deo : Graph Theory with Applications to Engineering and Computer Sciences, PHI.
4. Murry R. Spiegel**:** Discrete Mathematics (Schaums Outline series) Tata McGraw Hill (2009).

Reference Books

1. Kenneth H. Rosen : Discrete Mathematics and its applications,5th Ed. Tata McGraw Hill (2003).
2. K.R Parthasarty : basic Graph Theory, Tata Mc-Graw Hill

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Detailed Syllabus

Semester 4th

Computer Science & Engineering

Department of Computer Science & Engineering
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Subject	: Data Structures
Semester	: 4th
Department	: Computer Science & Engineering
Course No.	: CSE 401
Credits	: 4
L T P	: 3 1 0

Course Details:

Introduction: Basic concept of data, structures and pointers.

Arrays: Representation, implementation, polynomial representation. Limitations.

Strings: Representation, String operations, Implementing String.h library functions.

Linked List: Static and dynamic implementation. Single, double, circular, multiple linked lists.

Stacks: Recursion and Stacks. Static and dynamic implementation. Expression evaluation. Infix, postfix expressions, multiple stacks.

Queues: Static and dynamic implementation, circular queues, and implementation.

Hash Tables: Hash tables implementation. Hashing techniques, single, double.

Storage Management: Memory Management techniques, garbage collection.

Trees: Binary trees, binary search trees, static and dynamic implementation. Tree operations, insert, delete, and search.

Heaps: Implementation, sorting etc.

Sorting and Searching: Different sorting techniques. Insertion sort, selection sort, bubble sort, radix sort, quick sort, merge sort, heap sort.

Graphs: Representation of graphs, BFS, DFS sort. Graph Algorithms.

Books Recommended:

1. Data Structures by Rajni Jindal
2. Data Structures - Schaum's Series
3. Data Structures by Knuth
4. Data Structures by Farouzan
5. Data Structures using C and C++ by Langsam, Augestern, Tanenbaum.

Department of Computer Science & Engineering
National Institute of Technology Srinagar.

Subject	: Data Structures Lab
Semester	: 4th
Department	: Computer Science & Engineering
Course No.	: CSE 402 P
Credits	: 1
L T P	: 0 0 2

Lab Details:

Basic concepts of data, linear lists, strings, arrays and orthogonal lists, representation of trees & graphs, storage systems, Arrays, Recursion, Stacks, Queues, Linked lists, Binary trees, General Trees, Tree Traversal, Symbol Table and Searching Techniques, Sorting Techniques, graphs.

1. Implement singly and doubly linked lists.

2. Represent a polynomial as a linked list and write functions for polynomial addition.

3. Implement stack and use it to convert infix to postfix expression

4. Implement array-based circular queue and use it to simulate a producer-consumer problem.

5. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.

6. Implement binary search tree.

7. Implement priority queue using heaps

9. Implement hashing techniques

10. Implement various sorting techniques as taught in class.

11. Implement Dijkstra's algorithm using priority queues

12. Implement Prim's and Kruskal's algorithms

Subject	: Introduction to Probability Theory and Statistics
Semester	: 4^{th}
Department	: Mathematics
Course No.	: MTH 403
Credits	: 3
L T P	: 3 0 0

Course Details:

Measures of Central tendency and Measures of Variations (Dispersions), Moments, Measures of skewness and kurtosis.

Random experiment, sample space, Events, Classical statistical and Axiomatic Definitions of Probability. Statements and proof of theorems on addition and multiplication of probabilities. Simple problems.

Baye's theorem on conditional probability. Random Variables, Derivation of formulae for mean, Variance and moments of random variables for discrete and continuous cases.

Laws of expectation, Binomial, Poisson and normal Distributions, Beta and gamma Distribution, t-distribution, F-Distribution, Chi-square Distribution and their applications.

Methods of least squares, fitting a straight line and parabola of Degree 'p'. Regression and correlation. Multiple and partial correlation.

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Digital Electronics and Logic Design
Semester	: 4th
Department	: Electronics & Communication Engineering
Course No.	: ECE 403
Credits	: 4
L T P	: 3 1 0

Course Details:

Binary Systems: Number Systems (binary, octal, hexadecimal), conversion from one system to another, complements and codes.

Boolean algebra & Logic Gates: Basic Definitions, Theorems and Properties of Boolean Algebra, Boolean functions, Canonical and Standard Forms, Logic Operations & Gates

Simplification of Boolean Functions: Map Method and Tabulation Method (2, 3, 4, 5, 6 variables)

Combinational Logic: Design Procedure, Arithmetic and Arithmetic Circuits

Combinational Logic with MSI & LSI: Parallel Adder/ Subtractor, Decoders, Multiplexers, ROMs, PLA's

Sequential Logic: Flip-Flops (FF), Triggering, Analysis, State Reduction & Assignment,

FF Excitation Tables, ASM Charts, Design Procedure, Design of Counters, Design with State Equations

Registers, Counters: Shift Registers, Synchronous Counters

Data Conversion: ADC, DAC

VHDL Programming: Introduction, Code Structure, Data Types Operators & Attributes, Concurrent Code, Sequential Code, Signals & Variables, State Machines, Circuit Designs

Books Recommended:

1. Digital Logic & Computer Design, M Morris Mano, PHI.
2. Digital Electronics, Gupta & Singhal, Katson Books.
3. Circuit Design with VHDL, V A Pedroni.

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Digital Electronics and Logic Design Lab
Semester	: 4th
Department	: Electronics & Communication Engineering
Course No.	: ECE 404 P
Credits	: 1
L T P	: 0 0 2

Lab Details:

Hardware: Logic Gates, All Combinational Logic circuits to be implemented using IC Trainer kits or IC's and Bread Board

Software: VHDL Programs for Combinational Logic and Sequential Logic Circuits using Xilinx

List of experiments:

1.
   A. To verify the truth table of following logic gates:
      I. AND OR and NOT
      II. NAND, NOR, XOR and XNOR
   B. To realize the above gates using discrete active and passive components.
2. To implement XOR and XNOR using universal logic gates.
3.
   A. To verify De Morgans law using logic gates.
   B. To implement certain Boolean expressions and check their equality.
4. To design and realize:-
   a. Half adder and verify its truth table.
   b. Full adder and verify its truth table.
   c. Half subtractor and verify its truth table
   d. Full subtractor and verify its truth table.
5. To design a multiplexer/demultiplexer using two input NAND gates
6. To design a 4 bit binary to decimal converter.
7. To design a modulo-10 counter.
8. Given a frequency f obtain the waveforms with frequencies f/2,f/5 & f/10.
9. Design and realize the following flip flops using logic gates.
   . RS flip flop
   a. JK flip flop
   b. D flip flop
   c. T flip flop
10. Use PLL as:
   . Frequency multiplier.
   a. Frequency demodulator.

Department of Computer Science & Engineering
National Institute of Technology Srinagar.

Subject	:	Software Engineering
Semester	:	4^{th}
Department	:	Department of Information Technology
Course No.	:	IT 401
Credits	:	4
L T P	:	3 1 0

Course Details:

Introduction: What is software Engineering? Professional & Ethical responsibility, emergent systems properties, systems engineering, project management

Requirements and tools; requirements engineering process system model, critical system specification, informal and formal specifications;

Design methodologies: architectural design, distributed systems design, application architectures, object oriented design, real time software design, user interface design, rapid software development, software reuse

Structural and Functional Testing: Verification and validation, software testing, critical systems validation

Models for reliability and cost: Software cost estimation, quality management, process improvement, configuration management

Security Engineering, Service oriented software engineering, aspect oriented software engineering

Books Recommended

1. Software Engineering – A practitioner's approach by Roger S Pressman.
2. Fundamentals of Software Engineering by Ghezzi, jazayeri, Mandrioli.
3. Software Engineering by Sommerville.

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Communication Systems
Semester	: 4th
Department	: Electronics & Communication Engineering
Course No.	: ECE 408
Credits	: 4
L T P	: 3 1 0

Course Details:

Special analysis of Signals:
Fourier series of repetitive signals, Fourier transform of non-repetitive signals, Amplitude spectrum of special signals viz., pulse train and pulse waveform.

Modulation:
AM, DSB/SC, SSB, VSB, Angle modulation, NBFM, WBFM, Diode detector, Frequency discriminator, AM & FM, Transmitter.

Demodulation:
AM and FM signals, Radio Receivers – AM & FM (Block diagram)

Noise Analysis:
Performance of AM & FM Systems, in presence of noise Threshold in AM & FM, Demodulation, pre emphasis and De emphasis, in FM Systems.

Digital Communication:
Sampling, Quantization, quantization noise, Coding, Pulse code Modulation; differential PCM, ADPCM, Relative advantages and dis-advantages. Delta modulation, PWM & PPM.

Digital Modulation Techniques:
ESK,FSK, DPSK Schemes.

Department of Computer Science & Engineering
National Institute of Technology Srinagar.

Subject	: Communication Systems Lab
Semester	: 4th
Department	: Electronics & Communication Engineering
Course No.	: ECE 409 P
Credits	: 1
L T P	: 0 0 2

Lab Details:

i) Generation and detection of amplitude modulated signals.

ii) Generation and detection of frequency modulated signals.

iii) To measure sensitivity, selectivity, and fidelity of a radio receiver.

iv) To generate PAM and PDM signals using IC 555.

v) To test a pulse code modulator.

vi) To measure the noise figure of the following systems:-

A.M. System.

F.M. System.

Department of Computer Science & Engineering
National Institute of Technology Srinagar.

Subject	: Control Systems
Semester	: 4th
Department	: Electrical Engineering
Course No.	: ELE 407
Credits	: 3
L T P	: 3 0 0

Course Details:

Introduction to linear Control System:
Control Systems, types of control systems, feedback and its effects, mathematical modeling of physical systems.

System Representations:
Block diagrams, transfer functions, signal flow graphs, polar and Bode plot representation of loop gains of control systems.

Time Domain Analysis of Control Systems:
Typical test signals for time response of control systems, time domain performance of first and second order control systems (steady state response and transient response), P I D Controllers.

Stability of Control Systems:
Stability characteristic equation, state transition matrix, stability of linear time invariant systems, Rough-Hurwitz Criterion, Nyquist criterion, Root locus plot, Bode diagrams.

Frequency Domain Analysis of Control Systems:
Frequency domain characteristics second order systems relative stability, graphic methods of determining gain margin and phase margin, Nichols chart.

Introduction to Modern Control Theory:
State Equations, State Transition Matrix, State transition equations, State Diagrams, concept of controllability and observability.

Books Recommended:

1. Modern Control Systems by Ogatta
2. Automatic Control systems by B C Kuo

National Institute of Technology Srinagar

Hazratbal, Srinagar, Kashmir, 190 006. India

Detailed Syllabus

Semester 5th

Computer Science & Engineering

Department of Computer Science & Engineering
National Institute of Technology Srinagar.

Subject	: Computer Organization and Architecture
Semester	: 5th
Department	: Computer Science & Engineering
Course No.	: CSE 501
Credits	: 4
L T P	: 3 1 0

Course Details:

Introduction: Overview of basic digital building blocks; basic structure of a digital computer.

Number system and representation of information, arithmetic and logical operation, hardware implementation, Real numbers - fixed and floating point, IEEE754 representation.

Basic building blocks for the ALU: Adder, Subtractor, Shifter, Multiplication and division circuits.

CPU Subblock: Datapath - ALU, Registers, CPU buses; Control path - microprogramming (only the idea), hardwired logic; External interface. Various addressing modes. Concept of sub-routine and sub-routine call. Use of stack for handling sub-routine call and return, instruction interpretation and execution.

Memory Subblock: Memory organization; concepts of semi-conductor memory, CPU memory interaction, organization of memory modules, cache memory and related mapping and replacement policies, virtual memory.

I/O Subblock: I/O techniques - interrupts, polling, DMA; Synchronous vs. Asynchronous I/O; Controllers.

Introduction to VHDL concepts: examples to be taken up from the rest of the course for implementation.

Books recommended:

1. Computer Organization, **Hamachar, Vranesic & Zaky.**
2. Circuit Design with VHDL, **Volnei Pedroni**.

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Design & Analysis of Algorithms
Semester	: 5th
Department	: Computer Science & Engineering
Course No.	: CSE 502
Credits	: 4
L T P	: 3 1 0

Course Details:

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

Divide & Conquer: Structure of divide and conquer algorithms: examples, Binary search, Quick sort, analysis of divide and conquer run time reference relations.

Greedy method: Overview of the greedy paradigm, examples of exact optimization solution (minimum cost spanning tree), approximate solution (Knapsack problem), single source shortest paths.

Dynamic Programming: Overview, difference between dynamic programming and divide and conquer, applications: shortest path in graph, matrix multiplication, travelling salesman problem, longest common sequence.

Graph searching and traversal: Overview, traversal methods, depth first and breadth first search.

Back Tracking: Overview, 8-queen problem and Knapsack problem.

Branch & Bound: LC searching, bounding, FIFO branch and bound, Applications: 0/1 Knapsack problem, Travelling salesman problem.

Computational complexity: Complexity measures, Polynomial vs non-polynomial time complexity; NP hard and NP complete classes, examples

Books Recommended:

1. '*Introduction to Algorithms',* Thomas. H. Cormen

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Microprocessor
Semester	: 5th
Department	: Computer Science & Engineering
Course No.	: CSE 503
Credits	: 3
L T P	: 3 0 0

Course Details:

Microcomputer Structure and Operations: Basic Microcomputer Elements, Typical Microcomputer Structure, CPU, Memory System, Input Output

Microprocessors and Memory: Typical 8, 16 and 32 bit Microprocessors,8085 , Microprocessor Specification, Memory Technologies

Assembly Language Programming: Programming Model of 8085, Registers, Fetch, Execute Operation of CPU, Instruction Set Addressing Modes, Basic Operations, Microprocessor Arithmetic, Program Flow, Control Using Looping and Branching. Stack, Subroutines, Interrupts, Resets

Bus System: System Bus Structure, Bus Operations, Cycle by Cycle Operations, Timing and Control, Priority Management, Address Decoding

Microprocessors Interfacing : Interfacing concepts, Parallel Input Output, Memory Interfacing, Direct Memory Access. The Serial Subsystems. Programmable Peripheral Interface, Analog Converter Subsystem

Introduction to 8086 architecture. : Main features and addressing modes.

Latest Developments in Microprocessor Technology

Books Recommended:

1. Microprocessor by Goankar
2. Microprocessor by Douglas Hall

Department of Computer Science & Engineering
National Institute of Technology Srinagar.

Subject	: Microprocessor Lab
Semester	: 5th
Department	: Computer Science & Engineering
Course No.	: CSE 504 P
Credits	: 1
L T P	: 0 0 2

Lab Details:

1. To develop a program to add two double byte numbers.
2. To develop a subroutine to add two floating point quantities.
3. To develop program to multiply two single byte unsigned numbers, giving a 16 bit product.
4. To develop subroutine which will multiply two positive floating point numbers.
5. To write program to evaluate P* Q*+R* & S are 8 bit binary numbers.
6. To write a program to divide a 4 byte number by another 4 byte number.
7. To write a program to divide an 8 bit number by another 8 bit number upto a fractional quotient of 16 bit.
8. Write a program for adding first N natural numbers and store the results in memory location X.
9. Write a program which decrements a hex number stored in register C. The Program should half when the program register reads zero.
10. Write a program to introduce a time delay of 100 ms using this program as a subroutine display numbers from 01H to OAH with the above calculated time delay between every two numbers.
11. N hex numbers are stored at consecutive memory locations starting from X. Find the largest number and store it at location Y.
12. Interface a display circuit with the microprocessor either directly with the bus or by using I/O ports. Write a programme by which the data stored in a RAM table is displayed.
13. To design and interface a circuit to read data from an A/D converter, using the 8255 A in the memory mapped I/O.
14. To design and interface a circuit to convert digital data into analog signal using the 8255 A in the memory mapped I/O.
15. To interface a keyboard with the microprocessor using 8279 chip and transfer the output to the printer.
16. To design a circuit to interface a memory chip with microprocessor with given memory map.

Department of Computer Science & Engineering
National Institute of Technology Srinagar.

Subject	: Operating Systems
Semester	: 5th
Department	: Computer Science & Engineering
Course No.	: CSE 505
Credits	: 4
L T P	: 3 1 0

Course Details:

Introduction: Operating system and function, Evolution of operating system, Batch, Interactive, Time Sharing and Real Time System, System protection.

Operating System Structure: System Components, System structure, Operating System Services.

Concurrent Processes: Process concept, Principle of Concurrency, Producer Consumer Problem, Critical Section problem, Semaphores, Classical problems in Concurrency, Inter Process Communication, Process Generation, Process Scheduling.

CPU Scheduling: Scheduling Concept, Performance Criteria Scheduling Algorithm, Evolution, Multiprocessor Scheduling.

Deadlock: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from deadlock combined approach.

Memory Management: Base machine, Resident monitor, Multiprogramming with fixed partition, Multiprogramming with variable partition, Multiple base register, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Thrashing, Cache memory, Organization, Impact on performance.

I/O Management & Disk Scheduling: I/O devices and organization of I/O function, I/O Buffering, DISK I/O, Operating System Design Issues.

File System: File Concept, File Organization and Access Mechanism, File Directories, File Sharing, Implementation Issues.

Books Recommended:

1 J. Peterson, A. Silberschatz, and P. Galvin. *Operating System Concepts*, Addison Wesley, 3rd Edition, 1989.
2 M. J. Bach. *Design of the Unix Operating System*, Prentice Hall of India, 1986.
3 A. Silberschatz and P. Galvin. *Operating System Concepts*, Addison Wesley, 4th Edition, 1994.

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Database Management Systems
Semester	: 5th
Department	: Computer Science & Engineering
Course No.	: CSE 506
Credits	: 4
L T P	: 3 1 0

Course details:

Introduction: Purpose, data abstraction, data models, object based models, record based logical models, physical data model

Relational Database Design: Normalization – 1NF, 2NF, 3NF, BCNF, higher Normal forms, De-normalization

Query Processing: Overview, General Strategies, Query Representation, Query Transformation, Catalog information, Estimated size of relations, Measures of query cost, selection, sorting, Join & other operations, query evaluation & choice of evaluation plans.

Object Oriented & Object Relational Databases: New Applications, limitations due to 1NF, the object oriented Data model, nested relational model, querying with complex types, comparison of object-oriented & object relational databases.

Books Recommended:

1. R. El. Masri and S. B. Navathe. *Fundamentals of Data Base Systems*, Benjamin Cummings, 1989.
2. H. F. Korth and A. Silberschatz. *Database Concepts*, 2nd Edition, Mcgraw Hill, 1991.
3. J. D. Ullman. *Principles of Database and Knowledge Base Systems*, Vol. I & II, Computer Science Press, 1988.

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Database Management Systems Lab
Semester	: 5th
Department	: Computer Science & Engineering
Course No.	: CSE 507 P
Credits	: 1
L T P	: 0 0 2

The student will be exposed to database access techniques using an interactive approach. This approach will use Industry Standard Structured Query Language (SQL) to maintain tables to answer queries and maintain data using single tables and multiple table joins.

The student would have to develop and write SQL queries that will

1. Extract data from a single table
2. Use predicates and operators
3. Use SQL functions
4. Add, change and remove data in a data base
5. Manage database transactions
6. Create and manage tables and other data base objects
7. Control access to data
8. Join together data items from multiple tables
9. Use sub-queries for selection of data
10. Perform summery analysis

Department of Computer Science & Engineering
National Institute of Technology Srinagar.

Subject	: Data Communication
Semester	: 5th
Department	: Electronics and Communication Engineering
Course No.	: ECE 508
Credits	: 4
L T P	: 3 1 0

Course Details:

Data and Signals: Data, Signals, Types of Signals, Bandwidth, spectrum, Digitization of analog signals, sampling, Nyquist sampling theorem, quantization, quantization noise, Pulse code modulation

Digital modulation Techniques: ASK, FSK, PSK, DPSK, M-ary PSK, QAM. Signal constellation.

Line coding techniques: NRZ, RZ, Biphase, Manchester coding, AMI, HDBn

Transmission media: Guided and un-guided media, twisted wire pair, co-axial cable, optical fibre, microwave links, satellite microwave link, their characteristic features and applications for data transmission.

Data transmission: simplex, half duplex and full duplex, Asynchronous and synchronous data transmission. Carrier, bit and frame synchronization techniques, Phase lock loop.

Multiplexing Techniques: Frequency Division Multiplexing, Time Division Multiplexing, Wavelength division Multiplexing and Code Division Multiplexing. Spread Spectrum.

Errors in data communication: Types of errors, error detection and correction techniques, forward error correction, polynomial error detection scheme, computation of CRC. Hardware

Data communication network: Basic concept of network, Advantages and applications, Types of networks (LAN, MAN and WAN), Different network topologies like star, ring, hybrid, tree.

Books recommended

(i) William Stallings: Data & Computer Communications, 7th Ed, PHI
(ii) Andrew Tanenbaum, "Computer Networks" PHI
(iii) Sklar, "Digital Communications fundamentals & Applications" 2nd Ed Pearson Pub.
(iv) Keizer, " Local Area Networks" McGraw Hill

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Detailed Syllabus

Semester 6th

Computer Science & Engineering

Department of Computer Science & Engineering
National Institute of Technology Srinagar

Subject	: Artificial Intelligence
Semester	: 6th
Department	: Computer Science & Engineering
Course No.	: CSE 601
Credits	: 4
L T P	: 3 1 0

Course Details:

Introduction to AI. Agents and environments. Problem solving by search; uninformed search, informed ("heuristic") search, constrained satisfaction problems, adversarial search, Knowledge representation and reasoning; rule based representations, logical formalisms, frames or object oriented systems, network based approaches and mixed representations. Theorem-proving. Knowledge bases and expert systems.

Overview of LISP and PROLOG. Reasoning in uncertain environments. Planning communication and multi-agent systems. Learning, Vision, Natural Language Processing. Neural nets, non-monotonic logic, various case studies.

Books Recommended:

1. Charniak and Mcdermott. *Introduction to Artificial Intelligence*, Addison-Wesley, 1985.
2. Ginsburg. *Essentials of Artificial Intelligence*, Morgan Kaufmann, 1993. Winston. *Artificial Intelligence*, 3rd Edition, Addison Wesley, 1992.
3. Elaine Rich, Artificial Intelligence, PHI.

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Artificial Intelligence Lab
Semester	: 6th
Department	: Computer Science & Engineering
Course No.	: CSE 602 P
Credits	: 1
L T P	: 0 0 2

The laboratory will emphasize the use of PROLOG, LISP, CLOS (Common Lisp Object Systems), Expert System Shells, tools from public domain, and in-house work.

PROLOG LAB CONTENTS

- Input & Output
- Operators and Arithmetic

- Facts & Variables
  Simple facts and facts with arguments
- Rules & Predicates
  Simple Predicates, Predicate Inference, Goal queries
- Recursion
- Graph Traversal
  Depth First Search, Breadth First Search

Simulators:- 1) Win-Prolog
2) Strawberry Prolog

LISP LAB CONTENTS

- Data Types
  - symbols & lists
- Local variables & global variables
- Standard input/output
- Functions & predicates
- User defined functions
- Recursion
  - factorial, fibanocci

Simulators:- 1) Ansi common Lispworks Studio 6

Department of Computer Science & Engineering
National Institute of Technology, Srinagar

Subject	: Computer Networks
Semester	: 6th
Department	: Computer Science & Engineering
Course No.	: CSE 603
Credits	: 4
L T P	: 3 1 0

Course Details:

Basic concept of network: Advantages and applications, Types of networks (LAN, MAN and WAN), Different network topologies like star, ring, hybrid, tree.

Network Protocol Architecture: OSI Reference model, Layers of the OSI model. Physical, Data-link, Network, Transport, Session, Presentation and Application layer.

Network Switching Techniques: Circuit switched, message switching and packet switched networks, Datagram and virtual circuit services, Frame relay, ATM

Flow and Error Control: Stop and wait flow control, Sliding window flow control, error control protocols, ARQ techniques, Stop-&-wait ARQ, Go back by N ARQ, Selective repeat ARQ.

Routing algorithms: Routing tables, features of a routing algorithm, classification, optimality principle, sink tree, shortest path algorithm, Dijkstra algorithm, flooding, fixed routing, random routing, adaptive routing, distance vector and link state algorithm.

Congestion Control: Congestion in networks and quality of service.

Medium Access Control Protocols: TDMA, FDMA, CDMA, ALOHA, Slotted ALOHA, CSMA, CSMA/CD, Ethernet, Token Ring network

Network security: Need for network data security, plaintext, cifertext, encryption techniques, substitution, transposition, DES encryption standard, Private key, public key, Authentication.

Internetworking and Internet fundamentals: Network Interconnections, Bridges, Routers, Internet Concepts, Brief concepts about common Channel signaling and Integrated Digital Networking.

Books Recommended:

(v) William Stallings: Data & Computer Communications, 7th Ed, PHI
(vi) Andrew Tanenbaum, "Computer Networks" PHI
(vii) Sklar, "Digital Communications fundamentals & Applications" 2nd Ed Pearson Pub.
(viii) Keizer, " Local Area Networks" McGraw Hill

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Computer Networks Lab
Semester	: 6th
Department	: Computer Science & Engineering
Course No.	: CSE 604 P
Credits	: 1
L T P	: 0 0 2

Lab Details:

Laboratory 0: Introduction & Network Wire Crimping

Laboratory 1: Ethernet

Laboratory 2: Token Ring

Laboratory 3: Switched LANs

Laboratory 4: Network Design

Laboratory 5: ATM

Laboratory 6: RIP: Routing Information Protocol

Laboratory 7: OSPF: Open Shortest Path First

Laboratory 8: TCP: Transmission Control Protocol

Laboratory 9: Queuing Disciplines

Laboratory 10: RSVP: Resource Reservation Protocol

Laboratory 11: Firewalls and VPN

Laboratory 12: Applications

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Theory of Computation
Semester	: 6th
Department	: Computer Science & Engineering
Course No.	: CSE 605
Credits	: 4
L T P	: 3 1 0

Course Details:

Introduction: Complexity of computations, automata, computability, complexity, mathematical notions and terminology, definitions, theorems and proofs, types of proofs

Automata & Languages: Finite Automata, Non-determinism, regular expressions, non-regular expressions

Context free languages: context free grammar, pushdown automata, non-context free languages, equivalences, closure properties, concepts in parsing,

Computability theory: Turing machines, variants of Turing machines, the definition of algorithm

Decidability, reducibility, advanced topics in computability theory- recursion theorem etc.

Complexity theory- time complexity, space complexity, intractability

Books Recommended:

1. C. Papadimitrou and C. L. Lewis. *Elements of Theory of Computation* , Prentice-Hall, 1981.
2. J.E. Hopcroft and J.D. Ullman. *Introduction to Antomata Theory,*
3. *Languages of Computations* , Addison-Wesley, 1979. (Indian edition available from Narosa.)
4. Michael Sipser, *"Theory of Computation" , Cengage Learning*

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Computer Graphics
Semester	: 6th
Department	: Computer Science & Engineering
Course No.	: CSE 606
Credits	: 4
L T P	: 3 1 0

Course Details:

Introduction: Co-ordinate representation, Pixel, Raster Scan & Random Scan methods, colour CRT Raster scan basics, video basics, interactive devices, graphics input and output devices, mouse, track ball, light pen, digitizer, thumb wheel, raster scan graphics.

Graphics Primitives: 2D Primitives - Output primitives – Line, Circle and Ellipse drawing algorithms - Attributes of output primitives – Two dimensional Geometric transformation - Two dimensional viewing –Line, Polygon, Curve and Text clipping algorithms

Parallel and Perspective projections - Three dimensional object representation –Polygons, Curved lines, Splines, Quadric Surfaces- Visualization of data sets - 3D transformations – Viewing -Visible surface identification. Basic Raster Graphics Algorithms. Geometric Modelling in 3-D. Viewing in 3-D. Concept of Synthetic Camera. Dialogue Design. Graphics User Interfaces. Windowing Systems.

Rendering- Introduction to Shading models – Flat and Smooth shading – Adding texture to faces – Adding shadows of objects – Building a camera in a program – Creating shaded objects – Rendering texture – Drawing Shadows, Graphical Modelling of Discrete events.

Introduction to Picture Synthesis and Analysis. Conceptual Framework of an Interactive Graphical Simulation System. Simulation of Discrete Event Displays, Animation Techniques, Basic Rules for Animation. Graphical Simulation of continuous motion. Role of Virtual Reality in Graphical Simulation.

Books Recommended:

1. Newman & Sproul, Principles of Interactive Computer Graphics.
2. James D. Foley, Andries VanDam, Feiner Steven K. and Hughes John F. *Computer Graphics: Principle and Practice,* Addison-Wesley Publishing House.
3. Foley and VanDam. *Fundamentals of Interactive Computer Graphics,* Addison-Wesley.
4. Rogers D. F. *Procedural Elements of Computer Graphics,* McGraw Hill.
5. Dennis Harris. *Computer Graphics and Applications,* Hearn and Baker.
6. *Computer Graphics,* Prentice Hall of India.

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Computer Graphics Lab
Semester	: 6th
Department	: Computer Science & Engineering
Course No.	: CSE 607 P
Credits	: 1
L T P	: 0 0 2

Lab Details:

1. Implementation of Bresenhams Algorithm – Line, Circle, Ellipse.

Implementation of Line, Circle and ellipse Attributes.

2. Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear.
3. Composite 2D Transformations.
4. Cohen Sutherland 2D line clipping and Windowing
5. Sutherland – Hodgeman Polygon clipping Algorithm.
6. Three dimensional transformations - Translation, Rotation, Scaling.
7. Composite 3D transformations.
8. Drawing three dimensional objects and Scenes.
9. Generating Fractal images.

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Java Programming
Semester	: 6th
Department	: Computer Science & Engineering
Course No.	: CSE 608
Credits	: 3
L T P	: 2 0 2

Course Details:

Introduction to Java programming: The Java Virtual Machine , Variables and data types , Conditional and looping constructs ,Arrays .

Object-oriented programming with Java Classes and Objects: Fields and Methods, Constructors, Overloading methods, Garbage collection, Nested classes. Inheritance: Overriding methods, Polymorphism, Making methods and classes final, abstract classes and methods, Interfaces

Exception handling with try-throw-catch-finally construct: The Exception class ,The Object class: Cloning objects, The JDK LinkedList class, Strings, String conversions.Working with types: Wrapper classes, Enumeration interface. Packages: Package access, Documentation comments. Applets: Configuring applets, Applet capabilities and restrictions

Basics of AWT and Swing: Layout Managers, Event Handling , The Action Listener interface , Panels ,Classes for various controls, such as label, choice, list, Checkbox, etc. Dialogs and frames, using menus, Using the adapter classes, Graphics. Threads: Synchronisation, The I/O Package : InputStream and OutputStream classes , Reader and Writer classes . Basic concepts of networking : Working with URLs , Concepts of URLs , Sockets. Database connectivity with JDBC , Java security

Lab Details: Programs using constructor and destructor, Creation of classes and use of different types of functions, Count the number of objects created for a class using static member function , Write programs on interfaces ,Write programs on packages ,Write programs using function overloading ,Programs using inheritance Programs using IO streams ,Programs using files . Write a program using exception handling mechanism, Programs using AWT, Programs on swing, Programs using JDBC.

Books Recommended:

1. Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies
2. Java Programming John P. Flynt Thomson 2nd
3. Java Programming Language Ken Arnold Pearson
4. The complete reference JAVA2, Herbert schildt. TMH
5. Big Java, Cay Horstmann 2nd edition, Wiley India Edition
6. Core Java, Dietel and Dietel

NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR

Hazratbal, Srinagar, Kashmir, 190 006. India

Detailed Syllabus

Semester 7th

Computer Science & Engineering

Department of Computer Science & Engineering
National Institute of Technology Srinagar.

Subject	: Compiler Design
Semester	: 7th
Department	: Computer Science & Engineering
Course No.	: CSE 701
Credits	: 3
L T P	: 3 0 0

Course Details:

Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, tool based approach to compiler construction.

Lexical analysis: Interface with input, parser and symbol table, token, lexeme and patterns. Difficulties in lexical analysis, Error reporting and Implementation. Regular definition, Transition diagrams, LEX.

Syntax analysis: CFGs, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC.

Syntax directed definitions: inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions.

Type checking: type system, type expressions, structural and name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions.

Run time system: storage organization, activation tree, activation record, parameter passing, symbol table, dynamic storage allocation.

Intermediate code generation: intermediate representations, translation of declarations, assignments, control flow, Boolean expressions and procedure calls and Implementation issues.

Code generation and instruction selection: issues, basic blocks and flow graphs, register allocation, code generation, dag representation of programs, code generation from DAGs, peep hole optimization, code generator generators, specifications of machine.

Books Recommended:

1. A. V. Aho, R. Sethi, and J. D. Ullman. *Compilers: Principles, Techniques and Tools* , Addison-Wesley, 1988.
2. C. Fischer and R. LeBlanc. *Crafting a Compiler*, Benjamin Cummings, 1991.
3. A. C. Holub. *Compiler Design in C*, Prentice-Hall Inc., 1993. Appel. *Modern Compiler Implementation in C: Basic Design*, Cambridge Press.
4. Fraser and Hanson. *A Retargetable C Compiler: Design and Implementation* , Addison-Wesley.

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Compiler Design Lab
Semester	: 7th
Department	: Computer Science & Engineering
Course No.	: CSE 702 P
Credits	: 1
L T P	: 0 0 2

Lab Details:

Compiler is a System Software that converts High Level Language to low level language. Compiler is the software that bridges the gap between user and computer as it is difficult to program in lower level language. Machines understand low level and humans understand higher language. Compiler sits in between the two and does the bridging.

The Lab intends to make students implement lexical analysers and code for each of the following phases of a compiler. This will help the students to understand the compiler coding and working in detail.

The phases of a compiler are:

2. Lexical Analysis
3. Syntax Analysis
4. Semantic Analysis
5. Intermediate Code Generation
6. Code Optimization
7. Code Generation

A Linux Utility Lex and Yacc tool can be used along with knowledge of C or C++ programming.
Students are required to practice Lex and Yacc for compiler writing. Write programs that do the following:

- Check whether string belongs to grammar or not
- Generate a parse tree
- Find leading terminals
- Find trailing terminals
- Compute FIRST and FOLLOW of non-terminals
- Check if a grammar is left recursive
- Remove left recursion after identifying it in a grammar
- Remove left factoring
- Check Operator Precedence in a grammar
- Operations on Stack

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Network Security
Semester	: 7th
Department	: Computer Science & Engineering
Course No.	: CSE 703
Credits	: 4
L T P	: 3 1 0

Course Details:

Introduction to basics of cryptography, mathematical background (number theory, random numbers etc), secret key and public key encryption, Classical Encryption techniques, block cipher and stream ciphers, modes of operation. Steganography, DES, AES, RC5, Cryptographic Hash and MAC, Discrete Logarithm, Elliptic Curve cryptography, Public key encryption (Diffie-Hellman, RSA, ECC, DSA), Key Management, Public Key Infrastructures.

Introduction to computer networks and network security. Authentication and authorization overview, vulnerabilities, risk assessment, incidents, forensics. Hash functions (MD5, SHA etc),

Network Security Applications: Kerberos, X509 Authentication Service. Electronic Mail Security: Pretty Good Privacy, S/MIME. IP Security (IPSEC): VPN's . Web Security: SSL. System Security: Intruders, Malicious Software and Firewalls.

Introduction to Network Security Assessment and Security Monitoring. Issues: legal/political/ethical.

Books Recommended:

1. Cryptography and Network Security by William Stallings
2. Network Security and Cryptography by Bernard Menezes
3. Practical Cryptography by Ferguson & Schneier
4. Applied Cryptography by Bruce Schneier

Department of Computer Science & Engineering
National Institute of Technology, Srinagar.

Subject	: Network Security Lab
Semester	: 7th
Department	: Computer Science & Engineering
Course No.	: CSE 704 P
Credits	: 1
L T P	: 0 0 2

Lab Details:

Studying basic UNIX and windows commands. Detailed study of security attacks network protocols are exposed to. Students will learn how to perform some of those attacks using a virtual setup. They will need to understand the deployment and working of scanning tools and performing attacks using existing tools freely available on the internet.

Set up a testing environment for Network Security: Ideally a LAN should be used, but due to security reasons, we need to set up a virtual environment on a personal computer. A good internet connection is required to keep the communication going and continuously monitor the current status using different tools available.

Students should have an in depth information about network protocols like Address Resolution Protocol (ARP), Internet Protocol (IP), Transport Control Protocol (TCP), User Datagram Protocol (UDP), Internet Control Message Protocol (ICMP) and the signals exchanged in all of these protocols to understand how attacks can be designed and conducted. Study tools that are used by network administrators for monitoring the network for some untoward activity.

Objectives: Setting Up the System for testing purpose: Learning Basic Commands, Software Requirements. Security Attacks : ARP Attacks (ARP Cache Poisoning, ARP Man in the Middle Attack), IP Attacks (IP Fragmentation Attack, IP Teardrop Attack),ICMP Attacks(1 Ping of Death, Smurf Attack, ICMP Destination Unreachable, ICMP Redirect, ICMP Source Quench), TCP Attacks (SYN Flooding Attack, TCP RST Attack), UDP Attack.

Nmap Port Scanning: TCP Port Scanning (TCP Connect () Scanning, TCP SYN Scan, TCP FIN Scan, XMAS Scan, TCP NULL Scan), UDP Port Scanning, Performing Stealth Scan of a Selected Computer.

Subject	: Operations Research and Optimization
Semester	: 7th
Department	: Mathematics
Course No.	: MTH 715
Credits	: 3
L T P	: 3 0 0

The nature and development of operation research, problem formulation, Linear programming problem, Graphical, Simplex Method, Two phase, simplex method, Transportation and Assignment models.

Replacement Models- Simple problems. Game theory, two person zero sum game, Sequencing Models-processing n-jobs through two machine, processing n-jobs through three machines.

Queuing Theory: Single-Channel poisson Arrivals with exponential service (M/M/I) model.

Books Recommended

1. Linear Programming by G. Hadlay, Addison Wasley.
2. Operations Research – An Introductory by Hamidi A. Taha, Macmillan.
3. Operations Research – Methods and problems by M. Sasieni, A. Yaspam and L. Friedman, John Wily and Sons Inc. London.
4. Linear Programming by S.I. Gass, Mc-Graw Hill.
5. Operations research by Kanti Swarup and P.G. Gupta, Sultan Chand and sons.

National Institute of Technology Srinagar

Hazratbal, Srinagar, Kashmir, 190 006. India

Detailed Syllabus

Semester 8th

Computer Science & Engineering

Department of Computer Science & Engineering
National Institute of Technology, Srinagar

Subject	: Industrial Organization & Management
Semester	: 8th
Department	: Humanities and Social Sciences
Course No.	: HSS 801
Credits	: 3
L T P	: 3 0 0

Course Outcomes:

This course is intended to introduce concepts of industry and industrial policies, Management and its functions vis-á-vis economics and economic policies and their impact. This will help the engineering students to get acquainted with the practices of the corporate sector in advance as there is high absorbing potential for engineering students in corporate sector. It has been visualized from the past so many years that the Engineering students are being preferred on key managerial positions because of their aptitude, temperament and scientific proficiency. Thus it has become the need to instil managerial skills and corporate practices in engineering students. Further the competition in the market forces the education institutions to introduce courses that could provide competitive edge to their students. Thus this course will enhance the employment opportunities of the students.

Course Details:

1. Industry, meaning of Industrialization, Industrial revolution, Need problems and prospects of Industrial change in the developing countries.

2. **Industrial Evolution in India:**
   Downfall of early industries, evolution of modern industry, effects of partition, industrial policy and progress after independence.

3. **Forms of Industrial Organization:**
   a) Single Proprietorship
   b) Partnership
   c) Joint Stock companies.
   d) Cooperatives and
   e) State Enterprises.

4. **Growth of Industry and Management:** Meaning of industrial management, functions and tools of management, growth of management concepts.

5. **Objectives of Industrial Management:** Defining management objectives, managerial activity and objectives, tests of management of objectives, primary, secondary personal and social objectives of management.

6. **Management Organization:**Various forms of organization of departmentalization line staff, functional and committee organization, formal and non formal organization.
7. Management and Authority.

8. Decision Making in Management.

9. Leadership, Definition, Traits, inborn traits, acquired traits, analytical etc.,

10. Marketing of Industrial Products and the Sales Manager.

11. **Personal Management:**Recent changes in personal management function of personal departments, sections, training and placement other functions of personal department.

National Institute of Technology Srinagar

Hazratbal, Srinagar, Kashmir, 190 006. India

Detailed Syllabus

Electives

Computer Science & Engineering

CSE E01: SIMULATION AND MODELING 3 Credits (3-0-0)

Introduction and basic simulation procedures. Fundamentals of modeling, Classification of simulation models; The simulation process; System investigation, model formulation, validation and translation; Time flow mechanisms; Design of computer simulation experiments; Different types of simulation models: Monte Carlo simulation, discrete-event simulation. Continuous system simulation. Mixed continuous/discrete-event simulation. Queuing networks: analytical and simulation modeling of queuing systems. Input and output analysis: random numbers, generating and analyzing random numbers. Sample generation. Trace- and execution-driven simulation. Point and interval estimation. Simulation of complex discrete-event systems with applications in industrial and service organizations. Tactical planning and management aspects, Random variable generation and analysis.

CSE E02: GRAPH THEORY 3 Credits (3-0-0)

Introduction to Graph Theory, definition of graph along with the related terms: vertex (or node), edge (or arc), loop, degree, adjacent, path, circuit, planar, connected and component. Euler Circuits and Paths: Königsberg bridge problem, the Euler paths. Coloring Problems Adjacency Matrices, several algorithms to find a shortest path.

CSE E03: DIGITAL SIGNAL PROCESSING 3 Credits (3-0-0)

Signals as sequences. Linear time invariant operators. The impulse response. The discrete fourier transform. The ztransform. Aliasing in frequency and periodicity in time. Bandlimited- ness and the sampling theorem. Filters, FIR and IIR. Various properties of the transforms and their use in filter design. The fast fourier transform and its uses. Rudiments of Estimation. Applied topics.

CSE E04: MULTIMEDIA TECHNOLOGY 3 Credits (3-0-0)

Introduction to Multimedia, Multimedia Objects, Multimedia in business and work. Multimedia hardware, Memory & Storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools. Text, Sound MIDI, Digital Audio, audio file formats, MIDI Audio & Video Capture. Huffman Coding, Shannon Fano Algorithm,Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modeling. Finite Context Modeling, Dictionary based Compression, Sliding Window Compression, LZ77,LZW compression, Compression ratio loss less & lossy compression. Digital Audio concepts, Sampling Variables, Loss less compression, loss compression & silence compression. Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding. Video representation, Colors, Video Compression, MPEG standards, MHEG recent development in Multimedia.

CSE E05: LOGIC PROGRAMMING 3 Credits (3-0-0)

Introduction, Lambda Calculus, translating high level functional language into the lambda calculus, structured types, semantics of pattern matching and efficient compilation, list comprehension, polymorphic type checking, graph reduction of lambda expressions, lazy evaluation, Super combinators, SK combinators, G-code, strictness analysis, SASL, Examples of functional languages - ML, Haskell. Logic Programming : Logic and Reasoning, Logic programs, Prolog syntax and its principal primitives. Some important techniques: tail recursion, accumulators, difference lists. Some applications such as simple theorem proving, Natural Language Processing, Expert Systems. Implementation of logic programs. Constraint Logic Programming: constraint satisfaction, constraint propagation- rationale, methodology and examples.

CSE E06: EMBEDDED SYSTEMS 3 Credits (3-0-0)

Introduction, Characteristics of Embedding Computing Applications, Concept of Real time Systems, Challenges in Embedded System Design, Design Process, Requirements, Specifications, Architecture Design, Designing of Components, System Integration, Embedded System Architecture, Instruction Set Architecture, Embedded Processor/Microcontroller Architecture, CISC Examples, RISC Example, Memory S y s t e m Architecture, Caches, V M, Memory Management and Address Translation, I/0 Sub-system, Co-processors/Hardware Accelerators, Processor Performance Enhancement, Pipelining, Super-scalar Execution, CPU Power Consumption, Designing Embedded platforms, Using CPU Bus , Memory Devices and their Characteristics, I/O Devices, Component Interfacing, Designing with Processors, Implementation Programming, Program Design, Programming Languages, Operating System, Basic Features of an Operating System , Kernel Features, Real-time Kernels, Real-time Memory Management, I/O, Example Real-time OS, Evaluating and Optimizing Operating System Performance, Network Based Embedded Applications, Distributed Embedded Architectures, Internet-Enabled Systems, Wireless Applications, Embedded Control.

CSE E07: ADVANCED JAVA & ANDROID PROGRAMMING 3 Credits (3-0-0)

Collections, Multithreading , Networking , Enterprise Java Bean, Java Database Connectivity (JDBC), Servlets, JavaServer Pages (JSP), Remote Method Invocation, Common Object Request Broker Architecture (CORBA), Introduction Smart Phone Application Development. Android Architecture, USer Interface Architecture, UI Widgets, Notification and Toast, Menus, Dialogs, Lists, Locations and Maps. Working with Data Storage. Animation and Content Providers. Network Communication, Services, Publishing your App.

CSE E08: SYSTEM ON CHIP (SOC) 3 Credits (3-0-0)

Introduction to the concept of a SOC, Backgrounder, microprocessor and Microcontroller based systems, Embedded systems. Differences between Embedded systems and SOCs. System design , Concept of system, importance of system architectures, introduction to IMD, SSID, MIMD and MISD architectures, concept of pipelining and parallelism. Designing microprocessor /Microcontroller based system and embedded system. System design issues in SOCs. System buses: Introduction to busses used in SOCs. Introduction to AMBA bus. Detailed study of IBM's core connect bus, concept of PLB-processor local bus and OPB-on chip peripheral bus. Processors used in SOCs : Introduction to CISC ,RISC, Von Neuman and Harward Architecture. Concept of Soft processors and study of Microblaze RISC processor. Study of IBM's power PC, SOC implementation , Backgrounder – programmable logic and FPGA Architecture . Concept of embedded processors and study of virtex II PRO Architecture. Study of features like embedded RAMs ,multipliers ,Digital clock management etc. Introduction to tools used for SOC design, Xilinx embedded development kit.

CSE E09: ADVANCED INTERNET TECHNOLOGIES 3 Credits (3-0-0)

Advanced Internet Protocols DNS, Working of DNS, DNS Header, Type of Records in DNS, forward and Reverse lookup, Configuration of Open Source (OS) DNS, working of DDNS - DHCP, DHCP header, Working of DHCP, Configuration of OS DHCP - FTP, Working of FTP, Configuration of OS Public FTP server and Private FTP server Understanding IPv6, CIDR, Hierarchical Routing, and Routing Protocol over internet. Multimedia over Internet, Voice over IP, Virtual Private network Internet as a Distributed computing platform : Understanding Web Services technology, REST based web services (Resource Oriented Architecture) and Service oriented Architecture. Introduction to cloud computing, Working of Peer to Peer over internet , Advanced Internet programming: HTML 5.0, Rich Internet Technology, AJAX, FLEX , Integrating PHP and AJAX, Consuming Web Service with AJAX, Resource Syndication (RSS), Working principle of search engines. Internet Security Public Key Infrastructure, Client side Vulnerabilities, Server Side Vulnerabilities, Database Vulnerabilities, Secure Payment Mechanism, Security issues in cloud.

CSE E10: WIRELESS COMMUNICATION 3 Credits (3-0-0)

This course examines common and different aspects of wired and wireless networks. The topics covered are: antenna basics, radio propagation, coding and error control, MAC protocols, network layer protocols to address mobility, TCP and wireless, wireless LANs and ad-hoc networks, cellular communication concepts, wireless mesh networks, long-distance and last-hop wireless technologies, and security in wireless systems.

CSE E11: FAULT TOLERANT COMPUTING 3 Credits (3-0-0)

Fundamental Concepts: Definitions of fault tolerance, fault classification, fault tolerant attributes and system structure. Fault-Tolerant Design Techniques: Information redundancy, hardware redundancy, and time redundancy. Dependability Evaluation Techniques: Reliability and availability models: (Combinatorial techniques, Fault-Tree models, Markov models), Performability Models. Architecture of Fault-Tolerant Computers (case study): General-purpose systems, high-availability systems, long-life systems, critical systems. Software Fault Tolerance: Software faults and their manifestation, design techniques, reliability models. Fault Tolerant Parallel/Distributed Architectures: Shared bus and shared memory architectures, fault tolerant networks. Recent topics in fault tolerant systems: Security, fault tolerance in wireless/mobile networks and Internet.

CSE E12: IMAGE PROCESSING 3 Credits (3-0-0)

Digital image fundamentals and transforms. Elements of visual perception – Image sampling and quantization Basic relationship between pixels – Basic geometric transformationsIntroduction to Fourier Transform and DFT – Properties of 2D Fourier Transform – FFT – Separable Image Transforms -Walsh – Hadamard – Discrete Cosine Transform, Haar, Slant – Karhunen – Loeve transforms. Spatial Domain methods: Basic grey level transformation – Histogram equalization – Image subtraction – Image averaging – Spatial filtering: Smoothing, sharpening filters – Laplacian filters – Frequency domain filters: Smoothing – Sharpening filters – Homomorphic filtering. Model of Image Degradation/restoration process – Noise models – Inverse filtering -Least mean square filtering – Constrained least mean square filtering – Blind image restoration – Pseudo inverse – Singular value decomposition. Lossless compression: Variable length coding – LZW coding – Bit plane coding- predictive coding DPCM. Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG,Basics of Vector quantization. Edge detection – Thresholding - Region Based segmentation – Boundary representation: chair codes- Polygonal approximation – Boundary segments – boundary descriptors: Simple descriptors Fourier descriptors - Regional descriptors –Simple descriptors- Texture.

CSE E13: SYSTEM DESIGN USING HDL 3 Credits (3-0-0)

And logic gates: Review of binary number systems - Binary arithmetic – Binary codes – Boolean algebra and theorems - Boolean functions – Simplifications of Boolean functions using Karnaugh map and tabulation methods – Logic gates. Combinational logic: Combinational circuits – Analysis and design procedures - Circuits for arithmetic operations - Code conversion – Introduction to Hardware Description Language (HDL). Design with MSI devices: Decoders and encoders - Multiplexers and de-multiplexers - Memory and programmable logic - HDL for combinational circuits. Synchronous sequential logic: Sequential circuits – Flip flops – Analysis and design procedures - State reduction and state assignment - Shift registers – Counters - HDL for sequential logic circuits, Shift registers and counters. Asynchronous sequential logic: Analysis and design of asynchronous sequential circuits - Reduction of state and flow tables – Race-free state assignment – Hazards.

CSE E14: REAL TIME SYSTEMS 3 Credits (3-0-0)

Concept of Real Time System, Issues in real time computing, Performance measures of Real Time System, Performance measures of Real time Systems, Real Time Application. Task Assignment and Scheduling: Different task model, Scheduling hierarchy, Offline vs Online Scheduling, Clock Drives. Model of Real Time System, Scheduling hierarchy scheduling of Periodic Task: Assumptions, fixed versus dynamic priority algorithms, schedulability test for fixed priority task with arbitrary deadlines. Scheduling of A-periodic and Sporadic Tasks. Scheduling for applications having flexible constrains. Resources and Resource Access Control. Handling Resource sharing and dependency among real time tasks: Assumptions on resources and their usage, resource contention, resource access control (Priority Ceiling Protocol, Priority Inheritance protocol, Slack Based Priority Ceiling Protocol, Pre-emption Ceiling Protocol). Scheduling Real Time Tasks in Multiprocessor and Distributed Systems, Real Time Communication (hard and soft real time communication, traffic scheduling disciplines, QoS guarantees), Real Time Databases (Optimistic vs Pessimistic concurrency control protocols).

CSE E15: UNIX AND SHELL PROGRAMMING 3 Credits (3-0-0)

File and common commands - Shell - More about files - Directories- Unix system - Basics of file Directories and filenames - Permissions - modes - Directory hierarchy - Devices – the grep family - Other filters - the stream editor sed - the awk pattern scanning and processing language - files and good filters. Command line structure - Metacharacters - Creating new commands - Command arguments and parameters - program output as arguments – Shell variables - More on I/O redirection - loop in shell programs - Bundle - Setting shell attributes, Shift command line parameters - Exiting a command or the shell, evaluating arguments - Executing command without invoking a new process - Trapping exit codes – Conditional expressions. Customizing the cal command, Functions of command, While and Until loops - Traps - Catching interrupts - Replacing a file - Overwrite - Zap - Pick command – News command - Get and Put tracking file changes. Standard input and output - Program arguments - file access - A screen at a time printer - On bugs and debugging - Examples - Zap - pick - Interactive file comparison program - Accessing the environment - Unix system calls – Low level I/O, File system Directories and modes, Processors, Signal and Interrupts. Program development - Four function calculator - Variables and error recovery - Arbitrary variable names, Built in functions, Compilation into a machine, Control flow and relational operators, Functions and procedures - Performance evaluation - Ms macro package - Troff level – Tbl and eqn preprocessors - Manual page - Other document preparation.

CSE E16: HIGH SPEED NETWORKS 3 Credits (3-0-0)

High speed networks, Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL. High Speed LANs. Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.TCP and ATM congestion control , Integrated and Differentiated services, Integrated services architecture – approach, components, services- queuing, protocols for QoS support.

CSE E17: ADVANCED ALGORITHMS 3 Credits (3-0-0)

Advanced data structures: self-adjustment, persistence and multi-dimensional trees. Randomized algorithms: Use of probabilistic inequalities in analysis, Geometric algorithms; Point location, Convex hulls and Voronoi diagrams. Arrangements applications using examples, Graph algorithms; Matching and Flows. Approximation algorithms; Use of Linear programming and primal dual, local search heuristics. Parallel algorithms; Basic techniques for sorting, searching merging, list ranking in PRAMs, and interconnection networks.

CSE E18: RECONFIGURABLE COMPUTING 3 Credits (3-0-0)

FPGA architectures, CAD for FPGSa: overview, LUT mapping, timing analysis, placement and routing. Reconfigurable devices - from fine-grained to coarse-grained devices, Reconfiguration modes and multi-context devices, Dynamic reconfiguration, Compilation from high level languages, System level design for reconfigurable systems; heuristic temporal partitioning and ILP-based temporal partitioning. Behavioural synthesis, Reconfigurable example systems' tool chains.

CSE E19: COMPUTER VISION 3 Credits (3-0-0)

Image formation, Camera models, Light and color, Linear filters and edges, Feature extraction (corners and blobs). Grouping and fitting, Hough transform, RANSAC Alignment. Geometric vision, Camera calibration , Epipolar geometry, Two-view and multi-view stereo, Structure from motion. Recognition, Bags of features, Edge/feature extraction, correspondence and tracking, 3D structure/motion estimation. Object recognition, Scene and activity interpretation. Generative and discriminative models. Face detection and recognition. Segmentation, Optical flow, tracking.

CSE E20: ADVANCED COMPUTER NETWORKS 3 Credits (3-0-0)

Flow and Congestion Control; Window and Rate Based Schemes, Decbit, TCP. ATM, ABR, hop-by-hop schemes, Quality of Service: in ATM, IETF integrated services model, Differentiated Services Model. Flow identification, Packet Classifiers and Filters. Network Management: ASN, SNMP, CMIP. Issues in the management of large networks. Multicast: IGMP, PIM, DVMRP, Mobility: Mobile IP.

CSE E21: ADVANCED COMPUTER GRAPHICS 3 Credits (3-0-0)

Rendering: Ray tracing, Radiosity methods, Global illumination models, Shadow generation, Mapping, Anti-aliasing, Volume rendering, Geometrical Modelling: Parametric Surfaces, Implicit Surfaces, Meshes, Animation: Spline driven, quarternions, articulated structures (forward and inverse kinematics), deformation - purely geometric, physically-based. Monte Carlo algorithm, Photon mapping , Texture Synthesis and Image Processing; Anisotropic image smoothing; Volume Rendering , Volume graphics overview; Surfaces and Meshes Subdivision. Other Selected Topics.

CSE E22: ADVANCED DBMS 3 Credits (3-0-0)

User interfaces: forms, graphics, semi-graphics, spread sheet, natural language. Query optimization: techniques like query modification; Object oriented databases: notion of abstract data type, object oriented systems, object oriented DB design. Expert data bases: use of rules of deduction in data bases, recursive rules. Fuzzy data bases: fuzzy set & fuzzy logic, use of fuzzy techniques to define inexact and incomplete data bases.

CSE E23: ADVANCED COMPUTER ARCHITECTURE 3 Credits (3-0-0)

Single-threaded execution, traditional microprocessors, DLP, ILP, TLP, memory wall, Parallel programming and performance issues, Shared memory multiprocessors, Synchronization, small-scale symmetric multiprocessors on a snoopy bus, cache coherence on snoopy buses, Scalable multiprocessors, Directory-based cache coherence, Interconnection network, Memory consistency models, Software distributed shared memory, multithreading in hardware, Chip multiprocessing, Current research and future trends.

CSE E24: ADVANCED COMPILATION TECHNIQUES 3 Credits (3-0-0)

Introduction: compiler structure, architecture and compilation, sources of improvement. Control flow analysis: basic blocks & loops. Data flow analysis and optimizations:bit vectors, iterative frameworks, interval analysis, reaching definitions, liveness, common subexpression elimination, constant propagation. More control flow analysis: dominators, control dependence. Static-single assignment: static-single assignment, constant propagation. Scalar optimization: loop invariant code motion, common subexpression elimination, strength reduction, dead code elimination, loop optimizations, etc.Instruction scheduling: pipelined architectures, delayed-load architectures, list scheduling. Register allocation: coloring, allocation, live range splitting. Performance evaluation, Interprocedural analysis: side effects, flow-insensitive, flow-sensitive, constants, inlining. Alias analysis: alias analysis, method resolution. Data dependence analysis: dependence testing, dependence graphs. Loop transformations: interchange, tiling, fusion, distribution, splitting Just-in-time compilation: fast global optimization. Garbage collection: automatic memory management and data locality.

CSE E25: PRINCIPLES OF CRYPTOGRAPHY 3 Credits (3-0-0)

Introduction to Cryptography and Data Security, Mathematical Background for Cryptography: Number Theory, GCD, Groups, Rings, Fields, Chinese Remainder Theorem. Classical Cryptography: Introduction to Some simple cryptosystems and their Cryptanalysis. Shannon's Theory, Secret vs. Public Key Cryptography. Stream ciphers and Block Ciphers (Modes of Operation). DES and Alternatives, AES. Cryptographic Hash Functions and MAC. Public Key Cryptography, RSA Cryptosystem and Factoring Integers .Discrete Logarithm Problem in Prime Fields, Generalized Discrete Logarithm Problem. Attacks against Discrete Logarithm Problem. Public Key Cryptosystems based on the Discrete Logarithm Problem. Elliptic Curve Cryptosystems. Digital Signatures.

CSE E26: NEURAL NETWORKS 3 Credits (3-0-0)

Biological neural systems. Introduction to artificial neural networks. Real and Artificial Neurons, Associative Memory, Supervised and unsupervised learning. Merits and limitations of neurocomputing. Perceptron as a linear classifier. Perceptron learning algorithms.Multi-layer perceptron. Generalized delta-rule. Backpropagation learning. Linear associated memory networks. Bidirectional memory. Recurrent networks. Hopfield networks. Stochastic neural networks. Boltzmann machine. Simulated annealing. Kohonen networks. Self-organizing feature maps. Fuzzy neural networks. Genetic algorithms. Application of neural networks.

CSE E27: PERVASIVE COMPUTING 3 Credits (3-0-0)

Pervasive Architecture: Local Area Networks – Wireless LANs - Relationship of Wireless, Internet and Ubiquitous Computing – Pervasive Computing and Ubiquitous Computing - Ambient Computing – Pervasive Web application Architecture – Requirements of computational infrastructure - failure management – security – performance – dependability. Mobile Device Technologies: Context awareness - Language localization issues - User Interface design issues – Difference between UI design for mobile devices and conventional systems - Mobile Agents - Mobile Device technology overview . Sensor Networks and RFIDs: 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. Application of RFID Technologies. Local Area and Wide Area Wireless Technologies: IEEE 802.11 technologies - Infrared technologies - Bluetooth networks (OBEX Protocol) - Personal Area Networks – Mobility Management - Mobile IP - Establishing Wide area wireless networks - Concept and structure of ”cell” - Call establishment and maintenance - Channel management - Frequency Assignment techniques. Protocols and Applications: Networking protocols - Packet switched protocols - Routing Protocols for Sensor Networks - Data Centric Protocols - Hierarchical Protocols - Location-based protocols - Multimedia Messaging Service (MMS) Protocols - Wireless Application Protocol (WAP) – Applications of Pervasive Computing – Retail – Healthcare - Sales force automation – Tracking applications.

CSE E28: DISTRIBUTED AND PARALLEL COMPUTING 3 Credits (3-0-0)

An overview of parallel computing, Languages and programming environments, Message-passing computing, Partitioning and divide-and-conquer strategies, Pipelined computations, Synchronous computations, Load balancing and termination detection, Programming with shared memory. Algorithms and applications Components of distributed systems, communication technologies, communication services. Distributed algorithms and protocols: examples of distributed algorithms, clock synchronization, logical and vector clocks, election algorithms, consensus algorithms, proof of correctness, complexity analysis. Distributed operating systems: system models, file services, name services, process synchronization and coordination, case studies. Distributed shared memory: algorithms for implementing DSM, coherence protocols. Distributed resource management: load sharing, load balancing, resource monitoring. Failure recovery and fault tolerance: check-pointing, recovery, fault-tolerant models and protocols. Research issues in distributed systems, real-time protocols, standardization issues, cluster and grid computing.

CSE E29: CLOUD COMPUTING 3 Credits (3-0-0)

Cloud Computing Fundamental: Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications. : Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages. Cloud Services Management: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics : Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs .Application Development: Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, and Google App. Best Practice Cloud IT Model: Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO).

CSE E30: SOFTWARE PROJECT MANAGEMENT 3 Credits (3-0-0)

Project Management: The management spectrum, the people, the product, the process, the project, the W5HH principle, critical practices. Metrics for Process and Project: Metrics in the process and project Domains, software measurements, metrics for software quality, integrating metrics within software process, metrics for small organizations, establishing a software metrics program. Estimation: Observations, Project planning Process, software scope and feasibility, resources, software project estimation, decomposition techniques, empirical estimation models, estimation for object oriented projects, estimation for Agile development and web engineering projects, the make/buy decision. Project Scheduling: Basic concepts, project scheduling, defining a task set and task network, scheduling, earned value analysis. Risk Management: Reactive V/S proactive Risk Strategies, software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management, the RMMM plan Quality Planning: Quality Concepts, Procedural Approach to Quality Management, Quantitative Approaches to Quality Management, Quantitative Quality Management Planning, Setting the Quality Goal, Estimating Defects for Other Stages, Quality Process Planning, Defect Prevention Planning. Quality Management: Quality Concepts, Software Quality assurances, software reviews, formal technical reviews, Formal approaches to SQA, Statistical Software Quality assurances, Change Management: software Configuration Management, The SCM repository, SCM Process, Configuration Management for Web Engineering . Project Execution And Closure: Reviews. The Review Process, Planning, Overview and Preparation, Group Review Meeting, Rework and Follow-up, One-Person Review, Guidelines for Reviews in Projects, Data Collection, Analysis and Control Guidelines, Introduction of Reviews and the NAH Syndrome. Project Monitoring and Control: Project Tracking, Activities Tracking, Defect Tracking, Issues Tracking, Status Reports, Milestone Analysis, Actual Versus Estimated Analysis of Effort and Schedule, Monitoring Quality, Risk-Related Monitoring. Project Closure: Project Closure Analysis.

CSE E31: BIG DATA 3 Credits (3-0-0)

Large databases and their evolution. Big Data technology and trends, Big Data Introduction- Providing Structure to Unstructured Data, Identification, De-identification and Re-identification, Ontologies and Semantics - Classification, Classes with Multiple Parents, Choosing a Class Model, eXtensible Mark-up Language, Introduction to Meaning, Namespaces and the Aggregation of Meaningful Assertions, Data Integration and Software Interoperability, Immutability and Immortality Application Architecture, Ingestion and Streaming Pattern, Storage Patterns, Access Patterns, Discovery and Analysis Patterns, Visualization Patterns, Deployment Patterns, Big Dta NFR's, Case Studies. Special consideration made to the Map-Reduce paradigm. Searching, indexing, and their implications to memory management. Information extraction and feature selection. Supervised-, unsupervised-learning, and stream mining.

CSE E32: CYBER LAWS AND FORENSICS 3 Credits (3-0-0)

Cyber world: an overview, internet and online resources, security of information, digital signature, intellectual property (IP), historical background of IP, IPR governance, National patent offices, the world intellectual property organization (WIPO). Introduction about the cyber space, cyber law, regulation of cyber space, scope of cyber laws: e-commerce; online contracts; IPRs (copyright, trademarks and software patenting), e-taxation; e-governance and cyber crimes, cyber law in India with special reference to Information Technology Act, 2000.Introduction to computer and cyber crimes. Cyber crimes and related concepts, distinction between cyber crimes and conventional crimes, Cyber criminals and their objectives. Kinds of cyber crimes cyber stalking; cyber pornography, forgery and fraud, crime related to IPRs, cyber terrorism; computer vandalism etc. Cyber forensics, computer forensics and the law, forensic evidence, computer forensic tools. Regulation of cyber crimes, Issues relating to investigation, issues relating to jurisdiction, issues relating to evidence, relevant provisions under Information Technology Act 2000, Indian penal code, pornography Act and evidence Act etc. Copyright issues in cyberspace: linking, framing, protection of content on web site, international treaties, And trademark issues in cyberspace: domain name dispute, cyber squatting, uniform dispute resolution policy, computer software and related IPR issues.

CSE E33: EXPERT SYSTEMS 3 Credits (3-0-0)

Overview of AI and Expert System, Advantages and disadvantages of AI, Problem Solving, The anatomy of an expert system, Computational complexity of expert systems, Knowledge representation ,Knowledge engineering; the expert system development process. Design pattern: diagnosis and backward chaining, Expert System techniques, Relationship of Expert Systems to other computer-related areas. Neural Networks and Supervised and Unsupervised learning, Associative Networks. Fuzzy Logic, Future directions in AI and Expert Systems.

CSE E34: MOBILE COMPUTING 3 Credits (3-0-0)

Mobile Computing (MC) : Introduction to MC, novel applications, limitations, and architecture. GSM : Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.(Wireless) Medium Access Control : Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA. Mobile Network Layer : Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunnelling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP. Database Issues: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues. Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, pushes based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques. Mobile Ad hoc Networks (MANETs): Wireless Application Protocol-WAP.

CSE E35: GREEN COMPUTING 3 Credits (3-0-0)

Green Computing Fundamentals: Energy- efficient, power efficient and thermal aware computing and communication Newton's cooling model and basic thermodynamics and sustainability. Middleware Support for green computing: Power states Voltage and frequency scaling ACPI support for Linux and Power states, Voltage and frequency scaling, ACPI support for Linux and Windows, compiler optimization, virtualization and server consolidation. Tools for monitoring: Sensor networks, cooling equipment and their behaviour. HPC computing: Hadoop, Map-Reduce, Dynamic thermal-aware scheduling, Resource Management in Virtualized Environment. Green Mobile, embedded computing networking: Optimizing for minimizing battery consumption, Safe and Sustainable Cyber-physical systems (Medical devices).Management Frameworks Standards and metrics for green computing

MTH 707: NUMERICAL METHODS 3 Credits (3-0-0)

Representation of Numbers. Sources of errors and their propagation. Error analysis and the idea of conditioning. Linear systems of equations and their solutions. Gauss elimination and its complexity and robustness. Well-conditioning and matrix inversion. Gram-Schmitt orthogonalization. Interpolation and approximation. Divided differences. Interpolation at increasing number of points. Best approximation and orthogonal polynomials. Iterative methods for root finding. Rates of convergence. Fixed points. Iterative methods for linear systems. Numerical Differentiation. Ordinary Differential Equations and numerical Integration.

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