5. Design of combinational circuits using multiplexer
6. A. Adder/Subtractor circuits using Full-Adder using IC and/ or logic gates. B. BCD Adder circuit using IC and/ or logic gates
7. Realization of RS, JK, and D flip flops using Universal logic gates
8. Realization of Asynchronous up/down counter
9. Realization of Synchronous Mod-N counter
10. Digital to Analog conversion

Programming Practice Lab
Code: CS 391
Contacts: 3P
Credits: 2

Concepts of flow charts and decision tables, Examples and practice problems
Introduction to Digital Computers and its components, Introduction to DOS and UNIX Operating System

Development of Computer Program using C language- Roots of quadratic and Cubic equations; Summation of N Natural numbers; Arranging numbers in ascending and descending orders; Separation of odd and even numbers, problems on recursion, Arrays, Pointers, and File handling, etc.

Circuits & Networks Lab
Code: EE 391
Contact: 3P
Credit: 2

List of Experiments:

1. Transient response in R-L and R-C Network: Simulation/hardware
2. Transient response in R-L-C Series & Parallel circuits Network: Simulation/hardware
3. Determination of Impedance (Z) and Admittance(Y) parameters of two port network
4. Frequency response of LP and HP filters
5. Frequency response of BP and BR filters
6. Generation of Periodic, Exponential, Sinusoidal, Damped Sinusoidal, Step, Impulse, Ramp signals using MATLAB in both discrete and analog form
7. Evaluation of convolution integral, Discrete Fourier transform for periodic & non-periodic signals and simulation of difference equations using MATLAB
8. Representation of poles and zeros in z-plane, determination of partial fraction expansion in z-domain and cascade connection of second order system using MATLAB
9. Determination of Laplace transform and inverse Laplace transformation using MATLAB
10. Spectrum analysis of different signals

Note: An Institution/College may opt for some other software or hardware simulation wherever possible in place of MATLAB

number of pulses within specified time period)

9.	Study of 8051 Micro controller kit and writing programs for the following tasks using the kit a) Table look up b) Basic arithmetic and logical operations c) Interfacing of Keyboard and stepper motor	**6**
10.	Familiarization with EPROM programming and Erasing	**3**

Sixth Semester

Computer Network
Code: **CS 601**
Contact: **3L + 1T**
Credits: **4**
Allotted Hrs: **45L**

Note I: There will be one objective type question comprising 10 numbers spread over the entire syllabus and each carrying one mark.

Note II: Two questions are to be set from each module out of which five questions are to be answered taking at least one from each module. All questions carry equal marks.

Module I

Overview of data communication and Networking: [5L]
Introduction; Data communications: components, data representation(ASCII,ISO etc.),direction of data flow(simplex, half duplex, full duplex); Networks: distributed processing, network criteria, physical structure, type of connection, topology), categories of network (LAN, MAN,WAN);Internet: brief history, internet today; Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

Physical level: [5L]
Overview of data(analog & digital), signal(analog & digital), transmission (analog & digital)& transmission media (guided & non-guided); TDM, FDM, WDM; Circuit switching: time division & space division switch, TDM bus; Telephone network;

Module II

Data link layer: [6L]
Types of errors, framing(character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;

Medium access sub layer: [5L]
Point to point protocol, LCP, NCP, FDDI, token bus, token ring; Reservation, polling, concentration; Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA; Traditional Ethernet, fast Ethernet;

Module III

Network layer: [8L]
Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : Internet address, classful address, subnetting; Routing : techniques, static vs. dynamic routing , routing table for classful address; Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing; Protocols: ARP, RARP, IP, ICMP, IPV6; Unicast and multicast routing protocols.

Transport layer: [6L]
Process to process delivery; UDP; TCP; Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, choke packets; Quality of service: techniques to improve Qos.

Module IV

Application layer: [5L]
DNS; SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography, user authentication, security protocols in internet, Firewalls.

Modern topics: [5L]

3. Ghezzi, Software Engineering, PHI
4.Pankaj Jalote – An Integrated Approach to Software Engineering, NAROSA.
5.Object Oriented & Classical Software Engineering(Fifth Edition), SCHACH,TMH
6.Vans Vlet, Software Engineering, SPD
7.Uma, Essentials of Software Engineering, Jaico
8.Sommerville, Ian – Software Engineering, Pearson Education
9.Benmenachen, Software Quality, Vikas

Reference:

1. IEEE Standards on Software Engineering.
2. Kane, Software Defect Prevention, SPD

Computer Graphics & Multimedia

Code: **CS 603**
Contact: 3L
Credits: 3
Allotted Hrs: **45L**

Note I: There will be one objective type question comprising 10 numbers spread over the entire syllabus and each carrying one mark.

Note II: Two questions are to be set from each module out of which five questions are to be answered taking at least one from each module. All questions carry equal marks.

Module I

Introduction to computer graphics & graphics systems [6L]
Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & passive graphics devices; Computer graphics software.

Scan conversion: [6L]

Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Module II

2D transformation & viewing [8L]
Basic transformations: translation , rotation, scaling ; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection, shear;
Transformation of points, lines , parallel lines, intersecting lines. Viewing pipeline, Window to viewport co-ordinate transformation , clipping operations , point clipping , line clipping, clipping circles , polygons & ellipse.

3D transformation & viewing [7L]

3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, viewport clipping, 3D viewing.

Module III

Curves [3L]
Curve representation, surfaces , designs , Bezier curves , B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.

Hidden surfaces [3L]
Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods , fractal - geometry.

Color & shading models [2L]
Light & color model; interpolative shading model; Texture;

Module IV

Multimedia [10L]
Introduction to Multimedia: Concepts, uses of multimedia, hypertext and hypermedia.; Image, video and audio standards.

Audio: digital audio, MIDI, processing sound, sampling, compression.

Video: MPEG compression standards, compression through spatial and temporal redundancy, inter-frame and intra-frame compression .

Animation: types, techniques, key frame animation, utility, morphing.

Virtual Reality concepts.

Text Books:

1. Hearn, Baker – " Computer Graphics (C version 2nd Ed.)" – Pearson education
2. Z. Xiang, R. Plastock – " Schaum's outlines Computer Graphics (2nd Ed.)" – TMH
3. D. F. Rogers, J. A. Adams – " Mathematical Elements for Computer Graphics (2nd Ed.)" – TMH
4. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI
5. Sanhker, Multimedia –A Practical Approach, Jaico
6. Buford J. K. – "Multimedia Systems" – Pearson Education
7. Andleigh & Thakrar, Multimedia, PHI
8. Mukherjee Arup, Introduction to Computer Graphics, Vikas
9. Hill,Computer Graphics using open GL, Pearson Education

Reference Books:

1. Foley, Vandam, Feiner, Hughes – "Computer Graphics principles (2nd Ed.) – Pearson Education.
2. W. M. Newman, R. F. Sproull – "Principles of Interactive computer Graphics" – TMH.
3. Elsom Cook – "Principles of Interactive Multimedia" – McGraw Hill

System Software and Administration

Code: **CS 604**
Contact: **3L + 1T**
Credits: **4**
Allotted Hrs: **45L**

Note I: There will be one objective type question comprising 10 numbers to be set over the entire syllabus and each carrying one mark.

Note II: Two questions are to be set from each module out of which five questions are to be answered taking at least one from each module. All questions carry equal marks.

Module I

System Software [15]

Assemblers: General design procedures, Design of two pass assemblers, Cross Assemblers, Macro Processors – Features of a macro facility,(macro instruction arguments, conditional macro expansion, macro calls within macros), Implementation of a restricted facility : A two pass algorithm; Macro Assemblers.
Loader schemes: Compile and go loaders, absolute loaders, relocating loader, Linking, Reallocation- static & dynamic linking, Direct linking loaders, Binders, **Overlays**, dynamic binders; Working principle of Editors, Debuggers.

System Administration

Module II

Introduction: **[3L]**
Duties of the Administrator, Administration tools, Overview of permissions.
Processes: Process status, Killing processes, process priority. Starting up and Shut down:
Peripherals, Kernel loading, Console, The scheduler, init and the inittab file, Run-levels, Run level scripts.

Managing User Accounts: [2L]
Principles, password file, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users.

- Web document creation using Dreamweaver.
- Creating Animation using Flash.

SYSTEM SOFTWARE & ADMINISTRATION LAB
Code: **CS 694**
Contact: **3P**
Credits: 2

- Packet Monitoring software (**tcpdump, snort, ethereal**)
- Trace route, Ping, Finger, Nmap
- Server configuration (FTP, SMTP, DNS)
- NFS Configuration
- Firewall Configuration using **iptables/ipchains** (Linux only)
- Experiments using Turbo C Assembler

Note: All the above experiments may be performed in both Unix /Linux & Windows

Object Technology Lab
Code: **CS 695**
Contacts: **3P**
Credits: **2**

1. Assignments on class, constructor, overloading, inheritance, overriding
2. Assignments on wrapper class, vectors, arrays
3. Assignments on developing interfaces- multiple inheritance, extending interfaces
4. Assignments on creating and accessing packages
5. Assignments on multithreaded programming, handling errors and exceptions, applet programming and graphics programming
6. Use of CASE tools

Note: Use Java as programming language.

Language Processor
Code: CS 701
Contact: 3L
Credits: 3
Allotted Hrs: 45

Introduction to Compiling [3L]
Compilers, Analysis of the source program, The phases of the compiler, Cousins of the compiler.

Lexical Analysis [6L]
The role of the lexical analyzer**,** Tokens, Patterns, Lexemes, Input buffering, Specifications of a token, Recognition of a tokens, Finite automata, From a regular expression to an NFA, From a regular expression to NFA, From a regular expression to DFA, Design of a lexical analyzer generator (Lex).

Syntax Analysis [9L]
The role of a parser, Context free grammars, Writing a grammar, Top down Parsing, Non-recursive Predictive parsing (LL), Bottom up parsing, Handles, Viable prefixes, Operator precedence parsing, LR parsers (SLR, LALR), Parser generators (YACC). Error Recovery strategies for different parsing techniques.

Syntax directed translation [5L]
Syntax director definitions, Construction of syntax trees, Bottom-up evaluation of S attributed definitions, L attributed definitions, Bottom-up evaluation of inherited attributes.

Type checking [4L]
Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions

Run time environments [5L]
Source language issues (Activation trees, Control stack, scope of declaration, Binding of names), Storage organization (Subdivision of run-time memory, Activation records), Storage allocation strategies, Parameter passing (call by value, call by reference, copy restore, call by name), Symbol tables, dynamic storage allocation techniques.

Parallel Programming
Code: CS 704C
Credits : 3

Module I [10]
Introduction : Computational demands on modern science, advent of practical parallel processing, parallel processing terminology.
PRAM algorithms : model of serial computation, PRAM model of parallel computation, PRAM algorithms, reducing the number of processors.

Module II [10]
Processes and processors. Processor organizations, Processor arrays, Multiprocessors, Multicomputers, FLYNN's taxonomy, Shared memory. Fork. Join constructs. Basic parallel programming techniques- loop splitting, spin locks, contention barriers and row conditions.

Module III [10]
Variations in splitting, self and indirect scheduling. Data dependency-forward and backward block scheduling. Linear recurrence relations. Backward dependency. Performance tuning overhead with number of processes, effective use of cache.

Module IV [15]
Parallel programming examples: Average, mean squared deviation, curve fitting, numerical integration, Matrix multiplication, sorting, travelling salesman problem, Gaussian elimination. Discrete event time simulation.

Parallel Programming Languages :Fortran 90, C*,Sequent C, OCCAM,C- Linda,
Parallel programming under Unix.

Books:
1.Parallel Computing, Quinn,TMH
2.Introduction to Parallel Processing ,Sashi Kumar,PHI
3.Parallel Programming, Wilkinson, Pearson
4.Elements of Parallel Computing, Rajaraman,PHI
5.Fundamentals of Parallel Processing, Jordan, PHI
6. Advanced Computer Architecture, Hwang, TMH

Advanced Operating System
Code: CS 704D
Credits: 3

Process Synchronization [5]
Concepts of processes, Concurrent processes, Threads, Overview of different classical synchronization problems, Monitors, Communicating Sequential processes(CSP)

Process deadlocks [4]
Introduction, causes of deadlocks, Deadlock handling strategies, Models of deadlock

Distributed operating system [10]
Architectures, Issues in Distributed operating systems, Limitations of Distributed Systems, Lamport's logical clock, Global states, Chandy-Lampert's global state recording algorithm,Basic concepts of Distributed Mutual Exclusion ,Lamport's Algorithm, Ricart -Agrawala Algorithm;Basic concepts of Distributed deadlock detection, Distributed File system, Architecture, Design issues, SUN Network File system
Basic concepts of Distributed shared memory, Basic concepts of Distrubuted Scheduling, Load balancing, Load sharing

Distributed OS Implementation [4]
Models, Naming, Process migration, Remote Procedure Calls.

Multiprocessor System [6]
Motivation, Classification, Multiprocessor Interconnections, Types, Multiprocessor OS functions & requirements; Design & Implementation Issue; Introduction to parallel programming; Multiprocessor Synchronization.

Conventional Encryption and Message Confidentiality [8]
Conventional Encryption Principles, Conventional Encryption Algorithms, Location of Encryption Devices, Key Distribution
Public Key Cryptography and Message Authentication [8]
Approaches to Message Authentication, SHA-1, MD5, Public-Key Cryptography Principles, RSA, Digital Signatures, Key Management
Network Security Applications [4]
Kerberos Motivation, Kerberos Version 4, PGP Notation, PGP Operational Description
IP Security [2]
IP Security Overview, IP Security Architecture, Authentication Header
Web Security [7]
Web Security Threats, Web Traffic Security Approaches, Overview of Secure Socket Layer and Transport Layer Security, Overview of Secure Electronic Transaction
Intruders and Viruses [4]
Intruders, Intrusion Techniques, Password Protection, Password Selection Strategies, Intrusion Detection, Malicious Programs, Nature of Viruses, Types of Viruses, Macro Viruses, Antivirus Approaches
Firewalls [3]
Firewall Characteristics, Types of Firewalls, Firewall Configuration

Text :

1. "Network Security Essentials: Applications and Standards" by William Stallings, Pearson
2. "Network Security private communication in a public world", C. Kaufman, R. Perlman and M. Speciner, Pearson

Reference :

1. "Cryptography and Network Security", William Stallings, 2nd Edition, Pearson Education Asia
2. "Designing Network Security", Merike Kaeo, 2nd Edition, Pearson Books
3. "Building Internet Firewalls", Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition, O'Reilly
4. "Practical Unix & Internet Security", Simson Garfinkel, Gene Spafford, Alan Schwartz, 3rd Edition, O'Reilly

Advanced Java Programming
Code: CS 802E
Contact: 3L
Credits: 3
Allotted Hrs: 39L

Client & server side programming.
Enterprise architecture styles: Single tier , 2-tier , 3-tier, n-tier; Relative comparison of the different layers of architectures.
MVC Architecture: Explanation, Need, Drawbacks, J2EE WEB SERVICES, Different components & containers. [4L]
Servlet: Introduction, Advantages over CGI, How it works?, Servlet life cycle, Servlet API (Different interfaces & classes of generic servlet & HTTP servlet), Accessing user information by means of Request & Response, Servlet session management techniques and relative comparison. [4L]
JSP: Introduction, Comparison between JSP & servlet., Architecture/Life cycle, Different types of JSP architectures and relative comparison.; JSP tags ,Directives, Scripting elements, Actions; JSP implicit objects, Accessing user information using implicit objects. [5L]
EJB :Introduction, Comparison of EJB & Java Beans , Applications, Drawbacks, Different types of enterprise beans ,Services provided by EJB container. [5L]
RMI: Introduction and applications, Architecture ,Use of RMI Registry.
JNDI: Introduction and applications, Comparison between LDAP and JNDI
JDO (Java Data Objects): Introduction, Integration of EJB and JDO, JDO & RMI
JINI :Introduction, Applications [5L]
JDBC: Introduction, Database driver ,Different approaches to connect an application to a database server, Establishing a database connection and executing SQL statements, JDBC prepared statements, JDBC data sources. [5L]
XML: Java & XML, XML syntax, Document type definition., Parsers, SAX parsers, DOM parsers, SAX vs. Dom, JAXP and JAXB. [8L]

Text :

1. "Professional JAVA Server Programming", Allamaraju and Buest ,SPD Publication
2. "Beginning J2EE 1.4" Ivor Horton, SPD Publication.
3. "Advanced Programming for JAVA 2 Platform" Austin and Pawlan, Pearson

Reference Books:

1. Internet & Java Programming by Krishnamoorthy & S. Prabhu(New Age Publication)

Computer Science & Engineering Syllabus

Natural Language Processing:
Code: CS 802F Contact: 3L Credits: 3
Allotted Hrs: 39L
Introduction to NLP [2L]:
Definition, issues and strategies, application domain, tools for NLP, Linguistic organisation of NLP, NLP vs PLP.
Word Classes [13L]:
Review of Regular Expressions, CFG and different parsing techniques 1L
Morphology: Inflectional, derivational, parsing and parsing with FST, Combinational Rules
3L
Phonology: Speech sounds, phonetic transcription, phoneme and phonological rules, optimality theory, machine learning of phonological rules, phonological aspects of prosody and speech synthesis.
4L
Pronunciation, Spelling and N-grams: Spelling errors, detection and elimination using probabilistic models, pronunciation variation (lexical, allophonic, dialect), decision tree model, counting words in Corpora, simple N-grams, smoothing (Add One, Written-Bell, Good-Turing), N-grams for spelling and pronunciation. **5L**
Syntax [7L]:
POS Tagging: Tagsets, concept of HMM tagger, rule based and stochastic POST, algorithm for HMM tagging, transformation based tagging **4L**
Sentence level construction & unification: Noun phrase, co-ordination, sub-categorization, concept of feature structure and unification. **3L**
Semantics [9L]:
Representing Meaning: Unambiguous representation, canonical form, expressiveness, meaning structure of language, basics of FOPC **2L**
Semantic Analysis: Syntax driven, attachment & integration, robustness **2L**
Lexical Semantics: Lexemes (homonymy, polysemy, synonymy, hyponymy), WordNet, internal structure of words, metaphor and metonymy and their computational approaches
3L
Word Sense Disambiguation: Selectional restriction based, machine learning based and dictionary based approaches.
2L
Pragmatics[8L]:
Discourse: Reference resolution and phenomena, syntactic and semantic constraints on Coreference, pronoun resolution algorithm, text coherence, discourse structure **4L**
Dialogues: Turns and utterances, grounding, dialogue acts and structures **1L**
Natural Language Generation: Introduction to language generation, architecture, dicourse planning (text schemata, rhetorical relations). **3L**

Text Book:

1. D. Jurafsky & J. H. Martin – "Speech and Language Processing – An introduction to Language processing, Computational Linguistics, and Speech Recognition", Pearson Education

Reference Books:

1. Allen, James. 1995. – "*Natural Language Understanding*". Benjamin/Cummings, 2ed.
2. Bharathi, A., Vineet Chaitanya and Rajeev Sangal. 1995. *Natural Language Processing- "A Pananian Perspective"*. Prentice Hll India, Eastern Economy Edition.
3. Eugene Cherniak: "Statistical Language Learning", MIT Press, 1993.
4. Manning, Christopher and Heinrich Schütze. 1999. "*Foundations of Statistical Natural Language Processing*". MIT Press.