

SYLLABI

EC- 65001: INFORMATION THEORY AND CODING

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC 65001	Information theory & Coding	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:- Digital Communication, Probability

COURSE OUTCOMES:-

1. Design efficient source code for discrete memory less source and source with memory.
2. Calculate the channel capacities of discrete and continuous channel and understand trade off using Shannon's theorem.
3. Construct Galois field and apply linear block codes for detection and correction of error in transmitted data.
4. Apply cyclic codes and RS code for error detection and correction in transmitted data.
5. Applying convolution code for data.

THEORY:

1. **Information theory and Source coding:** Uncertainty, information, entropy and its properties, entropy of binary memory less source and its extension to discrete memory less source, source coding theorem, data compression, prefix coding, Huffman coding, Lempel-Ziv coding, Source with memory and its entropy. Kraft inequality, Run Length coding.
2. **Communication channels:** Discrete Communication Channel, Rate of information transmission over a discrete channel, Capacity of discrete memory-less channels. Binary Symmetric Channel, mutual information & its properties, Channel capacity, channel coding theorem and its application to BSC, Shannon's theorem on channel capacity, capacity of a channel of infinite bandwidth, bandwidth - S/N trade off, practical communication systems in light of Shannon's theorem, Fading channel, channels with memory.
3. **Groups, fields and Linear block codes:** Galois field and its construction in $GF(2^m)$ and its basic properties, vector spaces and matrices in $GF(2)$, Linear block codes, systematic codes and its encoding circuit, syndrome and error detection, minimum distance, error detecting and correcting capabilities of block code, decoding circuit, probability of undetected error for linear block code in BSC, Hamming code and their applications.
4. **Cyclic codes and Introduction to BCH codes:** Basic properties of Cyclic codes, Generator and parity check matrix of cyclic codes, encoding and decoding circuits, syndrome computation and error detection, cyclic Hamming codes, encoding and decoding of BCH codes, error location and correction.
5. **Convolution codes:** Introduction to convolution code, its construction and Viterbi algorithm for maximum likelihood decoding. Automatic repeat request strategies and their throughput efficiency considerations. State diagram, Tree diagram and trellis diagram, Distance properties of convolution code.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:

1. Lathi B. P., *Modern Analog and Digital Communication Systems*, Oxford Univ. Press
2. Shu Lin and Costello, *Error Control Coding : Theory and Application*, PH.
3. Sklar, *Digital Communication*, Pearson Education Asia.

REFERENCE BOOKS RECOMMENDED:

1. Haykins Simon, *Digital Communication*, Wiley Publ.
2. Proakis, *Digital Communication*, McGraw Hill
3. *Schaum's Outline Series, Analog and Digital Communication.*

EC- 65002: STOCHASTIC PROCESS AND QUEUING SYSTEMS

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC 65002	Stochastic Processes & Queuing systems	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:- Mathematics, Probability theory

COURSE OUTCOMES:-

Student should be able to:

- 1) Learn basics of probability theory and random variables.
- 2) Develop conceptual understanding of different random variable and their statistical parameters.
- 3) Learn the stochastic process and basics of game theory.
- 4) Analyze and design of various stochastic processes and their modeling.
- 5) Apply knowledge of stochastic process in queuing theory.

THEORY:

Review of Probability: Review of probability models, sample space, events, algebra of events, probability axioms, joint and conditional probability, Independent events, combinatorials, Bayes rule and Bernoulli trials. **Random Variables :** Discrete random variables, pmf and pdf, Bernoulli, Binomial, Geometric and Poisson pmf and their inter-relationship, probability generating functions, discrete random vectors.

Characterization of Random Variables : Exponential distribution and its memoryless property, erlang and gamma distribution functions and moments of random variables, transform methods, mean, variance and their relationship with moments, conditional expectation, joint distribution function, independent random variables.

Stochastic Process: Introduction to Game theory and stochastic game. Stochastic processes and their classification, Bernoulli process, Poisson process and its properties, Renewal processes.

Markov chains: Discrete and continuous parameter markov chains, computation of n-step transitions and steady state probabilities, irreducible finite chain with aperiodic states, Birth and death process.

Queuing Systems: M/M/I Systems, Memoryless arrivals and service, M/G/1 system, state diagrams, steady state probabilities, mean, delay and throughput, Little's theorem and its applications. **Networks of Queues :** Introduction to open and close queuing networks, Jackson's Networks, serial queues and feed forward networks, Jackson's theorem, Network performance measures.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Trivedi K.S., *Probability and Statistics with reliability, queuing and Computer Science Applns. II Ed.*, Wiley
2. Strack & Woods , *Probability & Random Processes with application to signal processing*, PHI
3. Peebles, *Probability, Random Variables and Random Signal Principles*, MGH.

REFERENCE BOOKS RECOMMENDED:

1. Papoulis, *Probability, random variables and stochastic processes*, MGH.
2. Ross S. M., *Introduction to probability models*, Academic press.
3. Garcia & Garcia, *Network Modeling, Simulation and Analysis*, Marcel Dekker Inc.

EC- 65003: NETWORK DESIGN TECHNOLOGY

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC 65003	Network Design Technology	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:- Computer Network, Data communication, Telecomm switching networks.

COURSE OUTCOME:-

Students should be able to:

1. Review of the concept of layering and design of various LAN technologies.
2. Understand the interworking of nodes in a computer network.
3. Analyze various interior and exterior gateway protocols.
4. Selection and analysis of various WAN technologies.
5. Analysis and comparison of frame relay and ATM.

THEORY:

1. **Review of concepts of layering and layered models** - OSI and TCP/IP .LAN technology : Transmission medium, topology and Medium Access Control (MAC) techniques including MAC and LLC sub-layers. LAN systems : Ethernet systems, Fast Ethernet and Gigabit Ethernet, Token ring and FDDI.
2. **Internetworking with TCP/IP** : Internet protocol (IP) suite including IPV4 and IPV6, transport protocols TCP and UDP.
3. **Introduction to IP routing** : Various interior Gateway protocols like RIP, OSPF and exterior Gateway protocol like BGP.
4. **WAN technology** : WAN v/s LAN, circuit switching mechanisms and network design, packet switched networking including routing and traffic control, X.25. ISDN and broadband ISDN : Overview, ISDN interfaces and functions, layers and ISDN services, B-ISDN standards, services. Introduction to label switching and MPLS
5. **High speed networks:** Frame relay, Frame relay protocols, services and congestion control. ATM : ATM Adaption layer (AAL), ATM traffic and congestion control, ATM LANs, ATM LAN Emulation (LANE) and Multi-Protocol Over ATM (MPOA)

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:

1. Comer, *Internetworking with TCP/IP Vol. 1*, PHI.
2. Stallng W., *Data and Computer Communication*, PHI.
3. Forouzan B., *Data Communication and Networking*, TMH.

Reference Books Recommended:

1. Tanenbaum, *Computer Networks*, PHI.
2. Radia Pearlman, *Interconnections, bridges, routers, switches and internetworking protocols*, Pearson Edu.
3. Kurose and Ross, *Computer Networking : A Top Down Approach*, Pearson Edu.

ELECTIVE - I

EC- 65201: SYSTEM INTEGRATION AND DATABASE

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC- 65201	Elective-I	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

THEORY:

Database fundamentals, relational model, DB application,
Data modeling, modeling exercise, normalization,
Relational query languages, SQP, database administration, ODBC,
DBA clients transaction management,
O-O databases, databases for the Web, ASP or coldfusion.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Connolly, T., Begg. C., and Strachan, *Database Systems*, Addison Wesley,
2. Sanders, G.L. *Data Modeling*, Boyd and Fraser Publishing Company.
3. Pressman, *Software engineering*, MGH.

Reference Books Recommended:

1. Hans Van Vilet, *Software engineering : principles and practice*, Wiley

ELECTIVE - I

EC- 65202: TELECOMMUNICATION BUSINESS ENGINEERING

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC- 65202	Elective-I	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

THEORY:

Telecommunication laws and policies, Strategic Telecommunication planning, telecommunication business processes, funding of telecommunication projects, financial aspect of telecommunication projects, financial components of a new private telecommunication network.

Overview of services, services construction, delivery, monitoring and evaluation, quality concept, ISO 9000 quality systems, QoS in telecommunication, key issues frame works, network performance engineering, and network integrity.

General marketing concepts of the IT and telecommunication sector, Generic architecture of network management products, configuration management, fault management, security management, network capacity planning.

Managing application portfolio resources, managing application development, alternatives to traditional development, managing networks and customer expectation, Change and Recovery Management, managing centralized and distributed operations, Subscriber Lease Agreement (SLA)

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Kalakota and Whinston, *Frontiers of electronic commerce*, Pearson Edu.
2. Held G., *Network management: Techniques and tools*, Wiley.
3. Carrol W. Frenzel, *Management of Information Technology*, Cambridge, M.A.

Reference Books Recommended:

1. Callon jack D., *Competitive Advantage Through Information Technology*, McGraw Hill.
2. Tapscott Don, *The digital economy*, McGraw Hill.
3. Kapoor, *Telecommunication business engineering*, Simbiosis, Pune.

ELECTIVE - I

CO-7002/CO-65203: PROGRAMMING SYSTEMS

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	CO-65203	Elective-I	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

THEORY:

Block schematic of Computer Hardware/Software, Fundamentals of programming, Steps in problem solving with digital computer.

Algorithms, Flow charts & Textual representations, Primitive actions, Control Constructs like conditions, iterations, conditional repetitions, recursion, Programming practice with Pascal or C.

Data & Data types, Data representations.

Data structures : Array, various operations with arrays, Concept of pointers & pointer manipulations, Pointers for data structures and functions, Static & Dynamic allocations, Implementation with arrays and pointers.

Various operations like Searching, Appending, Insertion & Deletion in Lists, Doubly linked lists and their implementation.

Stacks, Push/Pop and Top of stack operations, Application of stacks, Queues and various operations on Queues.

Tree: Binary & k-ary trees, Tree traversals, Insertions and Deletion in tree, B-Trees & AVL trees, Operations on these trees and their applications.

Searching & Sorting: Linear, Binary & Hash search, Minimum & Maximum selection, Divide & conquer.

Sorting: Insertion sort, Bubble sort, Bucket sort, Quick sort & Heap sort, Matrix operations, Dynamic Programming.

Overview of System Programs: Assemblers, Interpreters, Compilers, Editors, Linkers, Loaders and Operating Systems.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Kruze, *Data Structures and Program Design*, Prentice Hall.
2. Kernighan & Ritchie, *The C Programming Language*, 2/e, Prentice Hall of India.
3. Tenenbaum, *Data structures using C*, Pearson Edu.

Reference Books Recommended:

1. Knuth Donald, *Art of computer programming, Vol. I, II, III*, Pearson Edu. R
2. Martin Davis, *Computability and unsolvability*. R
3. Tamassia, *Algorithm Design*, Wiley Pub. R

ELECTIVE - I

MA 65204: ADVANCED ENGINEERING MATHEMATICS

SEMESTER-I

S.N.	Code No.	Subject	L	T	P	Theory Marks			SW	Viva	Total Marks
						Test-I	Test-II	End Sem.			
1.	MA-65204	Advanced Engineering Mathematics	4	-	-	25	25	75	-	-	125

COURSE OBJECTIVE

To introduce the concepts of matrices, linear algebra, neural network, non-linear and combinatorial optimization.

COURSE OUTCOMES

After completion of course, students will be able to

CO1: Use system of linear equations, linear transformations and matrix analysis concept to solve communication problem.

CO2: Use the correct techniques to solve the non-linear optimization problems.

CO3: Acquire the knowledge of graph theory and its application in solving optimization problems.

CO4: Understand the concept of vector space.

CO5: Implement the concept of neural network to train and analysis the data.

Unit-I: Linear system of equations: Basic Concepts, rank of matrix, linear independence, solution of linear system of equations: existence, uniqueness and general form, homogeneous and non-homogeneous equations. Eigen values. Eigen vectors. Matrix Eigen value problems. Applications of Eigen value problem.

Unit-II: Non-Linear optimization: Formulation of non-linear programming, General non-linear programming, programming problem. Lagrangean method, Kuhn-Tucker condition. Fibonacci search. Quadratic Interpolation.

Unit-III: Combinatorial Optimization: Introduction and basic terminology of graphs, path, circuit. Eulerian circuits, Hamiltonian cycles, shortest path problem. Dijkstra's algorithm. Tree, spanning tree, minimum spanning tree algorithms: Kruskal's and Prim's algorithm. Flow augmented path. Ford-Fulkerson algorithm, Max. Flow min. cut method theorem.

Unit-IV: Vector Spaces: General Vector Spaces, Subspaces, bases, dimensions, row-column and null spaces. Linear Transformation: Kernel and Range, Inverse transformation, matrices of linear transformation, change of basis diagonalization and similarity transform.

Unit-V: Neural Networks, back propagation and Fuzzy Logic.

Books for References:-

1. Erwin Kreyszig: Advance Engineering Mathematics, John Wiley and Sons, 8th Edi.
2. S. Rajasekran: Numerical methods in Science and Engineering, S. Chand and Co.2003
3. S.S. Sastry: Engineering Mathematics, Vol.II 2nd Edi. PHI, New Delhi
4. A. Populis: Probability, Random Variable and Stochastic Process.
5. V. Veerajan: Statistics, Probability and Random Processes.
6. Pannerselvan R. Operation Research, Prentice Hall of India Pvt. Ltd., New Delhi 2004.
7. Mamdani and Sugeno. TS Fuzzy
8. Introduction to Linear Algebra, Gilbert Strang 4th Edi., Wellesley Cambridge Press.

ELECTIVE - II

EC-64301: ADVANCED DIGITAL COMMUNICATION

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.		Elective-I	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

THEORY:

Introduction to digital modulation techniques and their spectral characteristics, optimum receivers for signals corrupted by AWGN and their performance for memoryless channel, optimum receivers for PCM, Regenerative repeaters and link budget analysis.

Estimation of signal parameters, carrier phase and symbol timings.

Signal design for band limited channels and their characterization, probability of error in detection of PAM with zero ISI, modulation codes for spectrum shaping.

Optimum receiver for channels with ISI and AWGN, linear equalization and decision feedback equalization, adaptive linear and adaptive decision feedback equalizer.

Multi-channel and multi-carrier systems, spread spectrum signals for digital communications, direct sequence spread spectrum signals and frequency-hopped spread spectrum signals and their performances, OFDM.

Characterization of fading multipath channels, frequency non-selective slowly fading channels, diversity techniques for fading multi path channels, coded waveforms for fading channels and their applications.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Proakis, *Digital Communication*, 5th Edition , McGraw Hill.
2. Blahut, *Digital Transmission of Information*.
3. Sklar B., *Digital Communication*, Pearson Education

Reference Books Recommended:

1. *Schaum's Outline Series, Analog and Digital Communication*
2. Haykins Simon, *Digital Communication*, Wiley Publ.
3. Glover & Grant, *Digital Communication*, Prentice Hall.

ELECTIVE - II

EC - 64302: NETWORK MANAGEMENT PROTOCOLS

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC 64302	Elective-II	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

THEORY:

Introduction to network management, its importance, objectives and goals, Network management system, functional areas of network management, Network management and monitoring, Structure of management information and MIBS. SNMP and UDP, host management and remote monitoring.

NMS Architectures and hardware considerations, SNMP compatible hardware.

Network management software, SNMP agents, NMS suites and element managers.

Configuring agents, parameter settings and security issues. Polling and settings, retrieving single and multiple MIB values and their error responses. Internal and external polling. Traps, extensible SNMP agents, adapting SNMP agents.

Network management applications, type of management applications, provisioning a management application, their features and implementation.

Operational Support System (OSS) to increase security, availability and reliability of telecommunication networks, OSS system to manage operations at transmission side and switching side, backward compatible bench mark for seamless integration of old and new network components.

Restoration of services in real time in case of failures using O&M (Operation and Maintenance) for different types of networks, Monitoring and Prevention. Subscriber Lease Agreements (SLA), issues in billing.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. D. Mauro and K. Schmidt, *Essential SNMP*, O'Reilly (SPD India)
2. J.D. Murray, *Windows NT SNMP*, O'Reilly (SPD India)
3. Terplan and Morreale, *The telecommunication handbook*, Springer

Reference Books Recommended:

1. Terplan and Morreale, *The advanced telecommunication handbook*, Springer
2. Newton, *Newton's Telecommunication Dictionary*, CMP Press.

ELECTIVE - II

EC64303/EE - 6304 / EE - 6533/EE - 6012: EMBEDDED SYSTEM'S PROGRAMMING

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC64303	Elective-II	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

THEORY:

Review of data structures and C programming for embedded systems.

Software tool-chains used for development and testing of C, project manager, editor, assembler, compiler, linker, locator, loader, debugger, monitor and profiler.

Use of VC++, Tornado or Codewarrior as IDE, GNU command-line tools, Build process.

Software architecture for implementing various tasks, round robin with and without interrupts.

Function Queue scheduling architecture, Real time operating system.

Writing sample codes in VC++ environment with multi-threaded implementation for standard functions like formation of data packets, transmission, receiving priority implementation, formation of queues, linked lists etc.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Michale Barr, *Programming Embedded Systems in C and C++*, SPD & O'Reilly
2. David E. Simon, *An Embedded Software Primer*, Addison Wesley.
3. A. Burns and A. Wellings, *Real Time Systems & Programming Languages*, Addison Wesley Longman.

Reference Books Recommended:

1. S. Maguire, *Writing Solid Code*, Redmond : Microsoft Press.
2. Grehan, Moore and Cyliax, *A Guide to 32-bit Embedded Development*, Addison Wesley Longman.
3. J.G. Ganssle, *The art of Programming Embedded Systems*, Academic Press.

ELECTIVE - II

EC64304/EC - 6534 / EE - 6206: DISTRIBUTED COMPUTING SYSTEM

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC64304	Elective-II	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

THEORY:

1. Review of asynchronous & synchronous transmission, Various error detection techniques, parity check, Vertical and longitudinal redundancy checks and CRC code and their error detecting capabilities, RS-232C and X.21 standards, modem operation, Null modem.
2. Data link Control, Point to point and multi-point links, flow control, sliding window protocol, various ARQ techniques for error control and their comparison, HDLC as bit oriented link control
3. Communication Networks: Circuit switching, message switching & packet switching and their comparison, virtual circuits and datagram, routing traffic and error control, Dijkstra and Bellman-Ford least cost algorithm, various routing protocols, deadlock and its avoidance.
4. Local Area Networks: Various topologies and medium access control schemes, comparison of CSMA/CD, token bus and token ring, various IEEE standards for LANs, UBS LANs.
5. Layered approach of OSI model for networks, Introduction to X.21 & X.25 access schemes.
6. Elements of client-server computing.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Stallings W., *Data & Computer Communications*, PHI
2. Keiser G., *Local area networks*, Tata McGraw Hill
3. Bertsekas D and Gallager R., *Data Networks*, PHI

Reference Books Recommended:

1. Schwartz M., *Telecommunication Networks : Protocols, Modelling and Analysis*, Addison Wesley.
2. Keshav S., *An engineering approach to computer networking* Pearson Education
3. Schiller J., *Mobile communication*, Addison Wesley.

EC 65305: DATA COMMUNICATION

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								T H	C W	S W	P R	Total
1.	EC 65305	Data Communication	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:- Digital communication, Computer Networks

COURSE OUTCOME:-

Students should be able to:

1. Recall concepts of digital communication system
2. Understand the interworking of nodes in a computer network.
3. Analyze and design various access schemes in the network.
4. Selection and analysis of various routing protocols.
5. Analyze and design error and flow control mechanism.
 1. Review of data communication concepts, channel capacity, various line codes, asynchronous and synchronous communication systems, bit and frame synchronization, framing errors, character and bit oriented synchronous communication systems.
 2. Point to point and multi-point links, polling systems, vertical and longitudinal redundancy checks, CRC codes, their generation and error detecting capabilities, RS-232 and X.21/25 standards, modem and null modem
 3. Flow control requirements, stop and wait protocol, Go-back-N and selective repeat request ARQ techniques, damaged frames and damaged acknowledgments, window size and its control, their performance analysis with and without error
 4. Circuit, message and packet switching, their comparison and applications, virtual circuits and datagrams, Least cost routing algorithm, various routing algorithms like flooding and adaptive routing, congestion control, deadlock and its avoidance
 5. Classification of multiple access techniques, controlled and random access, token polling, Aloha and slotted Aloha and their performance analysis, CSMA, CSMA/CD and CSMA/CA, Introduction to WLANs.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS:

1. Stallings W., 'Data and computer communication', Prentice Hall of India/Pearson Education
2. Keshav S., 'An engineering approach to computer networking' Pearson Education
3. Keiser G., 'Local area networks', Tata McGraw Hill

REFERENCE BOOKS:

1. Bertsekas D. and Gallager R., 'Data Networks', Prentice Hall of India
2. Schwartz M., 'Telecommunication Networks : Protocols, modeling and analysis', Prentice Hall,
3. Schiller J., 'Mobile communications', Pearson Education
4. Tanenbaum A. S., 'Computer Networks' Pearson Education
5. Rom R. and Sidi M., 'Multiple access protocols : Performance analysis', Springer Verlag
6. Black U., 'Data Networks', Prentice Hall of India
7. Sklar B., 'Digital Communications: Fundamentals and applications', Pearson Edu.
8. Forozon, 'Data Communication and networking', McGraw Hill

EC 65451 LAB-I

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC 6541	Lab-I	-	-	4	-	4	-	-	40	60	100

PRE-REQUISITES:- Operating systems, Programming system, Computer Peripherals, Signal Processing

COURSE OUTCOME:-

Students should be able to:

- 1) Understand the file system of operating system
- 2) Identify the various components of computer system
- 3) Learn the basic command sets of UNIX operating system
- 4) Practice the programming skills using ‘C’ and shell programming on UNIX operating system
- 5) Learn the basic system administration in UNIX

1. Computing sub-basics: Review of DOS structures (FAT, IO.SYS, MS.SYS, COMMAND.COM, interrupts) and DOS related internal and external commands, review of power-on booting sequence: various steps followed before loading OS in RAM, such as POST, BIOS and its various options.

2. Introduction to typical PC organization : Mother board, RAM, ROM, internal and external bus, ISA, EISA, PCI, SCSI and IDE controller, various peripherals (CDROM, HDD, floppy disk, speaker, printer, modem, plotter etc.) and their installation, Various interfaces like serial port, parallel port and USB.

3. C programming and shared libraries : C programming practice (as an supplement of CO 6523) including single stepping and break point debugging, gdb, strace, linking with libraries, make command and its applications, typedef struct, fopen, fclose etc. Source Controlled Command Sequence (SCCS) and CVS, shared libraries, mc file manager, examining core files. (Sample programs for inversion of matrix with floating points, various sorting and searching algorithms, FIR/IIR filter realization, convolution, Butterworth and Chebyshev filters).

4. Basic Unix Commands : Basic Unix commands like ls, pwd, cat, more, less, file, head, tail, grep, wc, rm, cp, mv, find, which, who, cut, paste, man, kill, prn, lpr, etc, ps, sort etc. and their variants using switches, multi-programming by running program in background using nohup, & etc. and writting shell script using them, error messages, wildcards, PATH, .bash_profile, directory manipulations, terminating commands, mcopy for coping in dos files, porting files from unix to other operating systems.

5. User account, Ownerships, Permission and Modification time : file ownerships, /etc/passwd, /etc/shadow, /etc/group, various file permissions and use of chmod comand, umask and stat, alises and their applications, touch, symbolic and hard links and their applications, process and its killing, mount command and its applications, quota, input/output redirection and piping, init, inetd, tcpd daemons etc.

6. Mail agent usage : Pine and its various settings including signature, forward etc., folder management in pine including pgp.

7. Shell Scripting, Process and Environment Variables :Overview of Unix directory layout, Elements of shell programming, ps, nohup, &, kill, signals, process priority scheduling, top, environmental variables and their settings, export of variables, regular expressions and its usage, brief study of awk, sed, at and writting small cron jobs, input output redirection and piping.

8. Editing text files : Vi editor and its varients like elvis and gvim, show mode and mode settings, auto indents, .exrc, .bash_profile etc. reading/writting from one file to another file within vi editor, usage of virtual console, streams and sed - stream editor.

9. ftp with its assoicated commands like dir, cd, lcd, get, mget, put, mput, binary, ascii, prompt, help, bye and telnet to other machines, -- options.

10. Working knowledge of X-window and export of display environment, X-clock, X-lock, ghostview etc.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

PRACTICALS:

LIST OF EXPERIMENTS

1. User level, directory & file creation, modification, hard & soft links, change of permission using UNIX commands.
2. Binary & ASCII file transfer among the machines using FTP and different FTP commands.
3. Configuration of various settings of X-window.
4. Interfacing RAM, HDD, CD-ROM drive on motherboard.
5. Hardware identification, modification and troubleshooting on motherboard.
6. Solving matrix equation using C programming and shared libraries.
7. Sample programs for searching and sorting.
8. Advanced text edition using vi editor.
9. Setting up mail server using SMTP & mail script.
10. Programming using shell script & awk script.
11. Router configuration for home computer networks.
12. Different topologies implementation for OSPF
13. VLAN & VTP configuration for secure communication.

Text Books Recommended :

1. Govindrajalu, *IBM-PC and clones*, TMH.
2. Strobel and Elling, *Linux: Unleashing the workstation in your PC*, Springer.
3. Kanetkar, *UNIX shells programming*, BPB Publ.

Reference Books Recommended:

1. Card, Dumas and Mevel, *The linux kernel book*, John wiley.
2. Campbell Richard, *Managing Andrew file system*, PH.
3. Mann and Mitchell, *Linux system security*, PH.

EC – 65452 LAB-II

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC 6542	Lab-II	-	-	4	-	4	-	-	40	60	100

PRE-REQUISITES:- Operating System, Computer Networks, Shell Programming

COURSE OUTCOME:-

Students should be able to:

- 1) Understand partitioning for various operating system and practice the installation procedure.
- 2) Configure a computer for network access and for various network services in client server environment.
- 3) Learn the higher level of system administration for UNIX operating system
- 4) Understand the domain name service and its configuration
- 5) Write shell programs for network services and their controls

PRACTICALS:

List of Experiments

1. Linux installation and Daemons: Distribution of Linux such as Redhat & its installation, Unix directory super structure, Sources & Binary Packages in a distribution, Creation and deletion of partitions, file systems, formatting (low and high level), mounting, Lilo, Initrd and Booting, block and super-blocks, Various Services and its application running under inetd, init, getty and Unix Run levels, Linux file system standard, Unix on a single floppy.
2. Networking interfaces : Various networking devices and its interfacing, LAN cable making including cross connect cable and Unix network commands like ifconfig, traceroute, ping, eth0, eth1, hostname, getty, netstat etc.
3. Introduction to IP : IP addresses and sub-netting
4. Introduction to linux system administration : directory structure and various important files including /proc. linux file system standards, creation and deletion of user and group under supervisor mode, quota and its usage, du, various log files in Unix and their usage, Crond, .rc and atd, who, w, users, id, effective UID, and user limits for checking user profile.
5. File compression, backups and archives: Elementary knowledge of tar, untar, gzip, gunzip etc.
6. Advanced shell Scripting using regular expressions and command line arguments, use of while, until, for, break, continue, glob expression, case, function, single, double and backward quote.
6. Practice on netscape navigator/internet explorer including saving favorite sites in preferences, downloading images, adding attachments, proxy setting, running antivirus at a given time and loading update automatically from web, elementary knowlege of html
7. Introduction to DNS & to Name Resolution, configuring TCP, UDP protocol suite, Network file system, NFS,.
8. Modem configuration and usage of AT commands, S-register settings etc.

ASSESMET:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

PRACTICALS:

LIST OF EXPERIMENTS

1. Linux installation, run levels , command execution like LILO, Intrid, superbloc, Inode for environment setting.
2. Configuration of various networking devices, preparation and testing of LAN cables.
3. Creation of network & sub network using sub-net masks IP address partitioning.
4. File system creation and modification in LINUX.
5. Backups, archives and file compression using tar, untar, gzip, gunzip.
6. Advanced shell script programming practice using expressions, command line arguments, use of while, until, break etc.
7. Proxy settings in explorer, Firefox for web browser.
8. Server configuration & setting for DNS , Name resolution, configuring TCP,UDP.
9. Modem configuration, testing & data transfer between two devices using AT commands, S register setting.
10. Experiments on DSP starter kit 6713
 - a. Matrix inversion
 - b. Filter design
 - c. Signal processing

Text Books Recommended :

1. Govindrajalu, *IBM-PC and clones*, TMH.
2. Strobel and Elling, *Linux: Unleashing the workstation in your PC*, Springer.
3. Kanetkar, *UNIX shells programming*, BPB Publ.

Reference Books Recommended:

1. Card, Dumas and Mevel, *The linux kernel book*, John wiley.
2. Campbell Richard, *Managing Andrew file system*, PH.
3. Mann and Mitchell, *Linux system security*, PH.

SEMESTER - II
EC - 65501: CRYPTOGRAPHY & E-SECURITY

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC 65501	Cryptography & E-Security	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

1. Understand various possible security violations in electronic data transfer, possible solutions and networks security models.
2. Design and analysis of various symmetric key systems and modes of operations & cryptanalysis.
3. Understand structure of finite field and its applications in cryptography.
4. Design and analysis of public key crypto systems, digital signature, hash functions etc.

THEORY:

The distributed information systems security problem: Basic definitions, risk analysis, physical security of systems, personnel security of documents and keys, Possible security violations, security attack, mechanism and services, X.800 security services and their categories, Network security models.

Cryptographic Tools: Symmetric key systems, Caesar, mono-alphabetic, playfair, Hill cipher, Affine Transformation etc., Block cipher method, Simplified DES, DES, Feistel algorithm, avalanche effect, block cipher modes of operation (ECB, CBC, CFB, OFB, CTR), RC5 Stream chipper.

Message digest functions, key management, privacy issues (clipper / skipjack.), Confidentiality. Diffie-Hellman key exchange algorithm, Asymmetric key systems, RSA, hash function and algorithms. Authentication requirements, message authentication codes, authentication protocols, kerberos, X.509 certificates. Message Security: Digital signature (RSA, DSS, MD5)

Elements of finite fields. $GF(p)$, euclid's algorithm of GCD and multiplicative inverse, polynomial arithmetic, triple DES, AES

Electronics Mail implementations (PGP, PEM, S/MIME), World Wide Web Transactions. System Security : E-security issues, types of network attacks (e.g. denial of service), firewalls, Demilitarized Zones (DMZ), Intrusion Detection System (IDS). System Management - IP security, SNMP Version, Database Security.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:

1. Stallings W., *Cryptography and network security*, Pearson Edu.,
2. Schiller, *Applied Cryptography*, Wiley.
3. Kahate, *Cryptography and network security*, TMH.

Reference Books Recommended:

1. C. Kaufman, R. Perlman, S. Speciner, *Network Security*, PH.
2. D. Champman, E. Zwickey, *Building Internet Firewalls*, O'Reilly and Associates.
3. Albrecht Beutelspacher, *Cryptology*, Cambridge Univ.

EC - 65502: MOBILE AND SATELLITE COMMUNICATION

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC65502	Mobile & Satellite Communication	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:- Communication Engineering, Digital Communication, Telecommunication Switching Systems

COURSE OUTCOME:-

Students should be able to:

1. Understand design parameters of cellular systems.
2. Understand concepts of various speech coders /decoders and modulator/demodulator used in GSM system.
3. Understand GSM and CDMA standards.
4. Learn fading channel characterization and mitigation techniques, so as to evaluate and enhance the performance of wireless communication system.
5. Understand various wireless MAC layer protocols.

THEORY:

1 Review of wireless and cellular radio Communication: Basics of GSM, The cellular concept, system design fundamentals, frequency reuse, reused distance, cluster size, channel assignment strategies, hand-off strategies, co-channel interference and system capacity, trucking and grade of service. Wideband CDMA concepts/principles.

2. Speech coding for wireless system applications and broadcast systems, Coding techniques for audio and voice and popular speech codes. Modulation techniques for mobile and satellite communication, their generation, detection and performance of spectral and power efficiency.

3 Brief introduction to radio channel characterization, multi-path propagation, co-channel interference, exponential power delay profile, propagation effects, scattering, ground reflection, fading, Log normal shadowing, coherence bandwidth. Statistical characterization of Radio Channel. Channel capacity of fading channel.

4. Physical layer techniques: diversity, spread spectrum, frequency hopping, direct sequence, adaptive equalization, Orthogonal Frequency Division Multiplexing (OFDM). Capacity of wireless channel and Spatial Multiplexing.

5. MAC Schemes: Wide Band Systems, CDMA and OFDMA. Introduction to GEO, MEO and LEO satellite systems, Antenna positioning in GEO and link calculations.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:

1. Rappaport T.S., *Wireless Communications: Principles and Practice*, PH
2. A.F.Molish, *Wireless Communication*, Pearson edu.
3. Schiller J., *Mobile communication*, Addison Wesley.

Reference Books Recommended:

1. Wilkis and Garg, *Principles of GSM Technology*, PHI.
2. Ramji Prasad and Richard Van Nee, *OFDM Wireless Multimedia Communication*, Artech House.
3. Fehar K., *Wireless Digital Communication*, PHI.

EC - 65503 / EE - 6254: OPTICAL COMMUNICATION

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC65503	Optical communication	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:- Analog and digital communication, Electronic devices, Physics.

COURSE OUTCOME:-

Students should be able to:

1. Understand Optical Fiber Communication System and its parameters.
2. Analyze of transmission characteristics of optical fiber and their effects.
3. Understand the construction and operation of various optical sources and detectors.
4. Design and performance analysis of optical receivers.
5. Understand the techniques of optical fiber joints and their connectorization and brief introduction of optical fiber networks

THEORY:

1. Review of optical fibre communications, forms of communication systems, elements of an optical fibre transmission link, optical fibre systems. Optical fibres : Structure & wave guiding fundamentals, basic optical laws, optical fibre modes & configuration mode, theory for circular wave guides, graded index fibre structure.
2. Signal degradation in Optical Fibre : Overview of fibre materials, signal distortion in optical wave guides, pulse broadening due to various types of dispersion mechanisms, mode coupling, optical fibre measurements.
3. Optical sources and photo detectors : LEDs, LASER diodes, light sources linearity, modal and reflection noise. Physical principles of photo diodes, photo detector noise, detector response time, Avalanche multiplication noise, photo diode materials.
4. Power launching & coupling : Source of fibre power launching, lensing scheme for coupling improvement, fibre to fibre joints, splicing techniques, Optical fibre connectors. Introduction to coherent optical communication & applications of optical fibres. Optical modulation & receiver operation : Analog & digital modulation, fundamental receiver operation, digital receiver performance calculation, preamplifier design, analog receivers, heterodyne receiver.
5. Optical networks : Evolution of optical networks, SONET/SDH, WDM networks : architecture, elements and design.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:

1. Senior J.M., *Optical Fibre Communications: Principles & Practice*, PHI.
2. Keiser G, *Optical Fibre Communication*, McGraw Hill.
3. Agrawal Govind P., *Fibre Optic Communication Systems*, John Wiley & Sons, students Ed.

Reference Books Recommended:

1. Djfar K Mynbaev & Scheiner, *Fibre Optic Communication Technology*, Pearson.
2. Ramaswami and Sivrajan, *Optical Networks: A Practical Perspective*, Pearson.
3. Black Uyles, *Optical Networks and 3rd Generation Transport Systems*, Pearson.

ELECTIVE – III

EC - 65702: MODELING AND SIMULATION OF COMPUTER NETWORKS

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC65702	Elective-III	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

THEORY:

Introduction to discrete-event system simulation, its applications, advantages and disadvantages, System and system environment, components of a system, discrete and continuous systems, modeling of a system and types of models, Various steps in simulation study, General principles and concepts in discrete event simulation.

Statistical models in simulation: review of terminology and concepts, useful statistical models, discrete distributions, continuous distributions, Poisson process and empirical distributions.

Queuing models: characteristics of queuing systems, transient and steady state behavior of queues, measures of performance using queuing systems property.

Random numbers and random number generation : properties of random numbers, generation of pseudo random numbers, tests for random numbers, Random variate generation, inverse transform technique, direct transformation for normal distribution, convolution method and acceptance - rejection technique.

Input modeling: data collection, identifying the distribution with data, parameter estimation, and goodness of fit tests, selection of input model without data, multivariate and time series input models.

Verification and validation of simulation models : output analysis for a single model, stochastic nature of output data, types of simulation with respect to output analysis, Measures of performance and their estimation, output analysis for terminating simulations, output analysis for steady-state simulations.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Law and Kelton, *Simulation, Modeling and Analysis, 2nd Ed.*, MH.
2. Bank and Carson, *Modeling and simulation*, PHI.
3. Garcia & Garcia, *Network Modeling, Simulation and Analysis*, Marcel Dekker Inc.

Reference Books Recommended:

1. Schwartz M., *Telecommunication Networks : Protocols, Modeling and Analysis*, Addison Wesley.
2. Leigh J. R., *Modeling and simulation*, Peter Peregrims.
3. Keitz Devlin, *The millennium problems*, Basic books (Perseus) USA.

ELECTIVE - III

EC 65703: DIGITAL SIGNAL PROCESSING

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC65703	Elective-III	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:- Engineering Mathematics, Communication Engineering, Network Analysis.

COURSE OUTCOME:-

Students should be able to:

1. Understand time and frequency domain representation of discrete time signals and systems.
2. Find the response of a discrete time system for arbitrary inputs to design DTS.
3. Compute numerically the response of DTS for finite time inputs.
4. Design and realize digital IIR, FIR filters.

THEORY:

Discrete time signals: sequences and systems, Linear time-invariant systems and their properties.

Difference equations, Frequency domain representation of discrete-time signals and systems, Representation of sequences by Fourier transforms and respective properties.

Sampling of continuous-time signals and Z-transform, Discrete-time processing of continuous time signals, Continuous-time processing of discrete-time signals, Properties of Z-transform.

Inverse Z-transform, Inverse Z-transform using contour integration, Complex convolution theorem, Parseval's relation, Unilateral Z-transform.

Transform analysis of Linear Time-Invariant (LTI) Systems - Frequency response of LTI systems, Systems functions.

Frequency response for rational system functions, relationship between magnitude and phase, all-pass systems, Minimum-phase systems.

Structures of discrete-time systems: Signal flow graph representation of linear constant coefficient difference equations, Basic network structures for FIR systems, Design of FIR filters by windowing, Kaiser window.

Basic structures of IIR systems, Transposed forms, Design of discrete-time IIR filters from continuous-time filter, Frequency transformations of low pass IIR filters.

Discrete Fourier Transform (DFT) and its properties, Linear convolution using DFT, Computation of Discrete Fourier Transform - efficient computation of the DFT, Goertzel algorithm.

Decimation in-time FFT algorithms, Decimation-in-frequency FFT algorithms, Implementation of the DFT using convolution.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Oppenheim & Schaffer, *Digital Signal Processing*, PHI.
2. Proakis, *Digital Signal Processing*, PHI.
3. Mitra Sanjit, *Digital Signal Processing: A Computer Based Approach*, TMH.

Reference Books Recommended:

1. Sarkar N., *Digital Signal Processing*, Khanna Publishers.
2. *Schaum's Outline Series, Digital Signal Processing*.
3. Salivahanan & Vallavaraj, *Digital signal processing*,

ELECTIVE - III

EC65704/CO - 6573 / CO - 7354: OPERATING SYSTEMS

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC65704	Elective-III	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

THEORY:

Introduction to Operating Systems: Functions, Evolution, Different Types, Desirable characteristics and features of an OS, Operating systems services, Types of services, Different ways of providing these services - Utility programs and System calls.

File Systems : File concept, User's and System programmer's view of File System, Disk organization, Tape organization, Different Modules of a File System, Disk - Space Allocation Methods, Contiguous, Linked, Indexed, Directory Structures, File Protection, System calls for File Management, Disk scheduling Algorithms.

CPU Scheduling : Process concept, Scheduling concepts, Types of Schedulers, Process State Diagram, Scheduling Algorithms, Algorithm Evaluation, System calls for process management, Multiple processor Scheduling.

Memory Management : Different Memory Management Techniques - Partitioning, Swapping, Segmentation, Paging, Paged Segmentation, Comparison of these techniques, Techniques for supporting the execution of large programs, Overlays, Dynamic linking and loading, Virtual memory concepts, Implementation by Demand Paging etc.

Concurrent Processes: Real and Virtual Concurrency, Mutual Exclusion, Synchronization, Interposes Communication, Critical Section Problem, Solution to Critical Section Problem, Semaphores - Binary and counting semaphores, Wait / Signal operations and their implementation.

Deadlocks: Deadlock Problem, Congestion Prevention, Avoidance, Recovery.

Input / Output: Principles and programming about Disk, RAM disk, and Terminal drivers.

Introduction to Network, Distributed and Multiprocessor Operating Systems.

Case studies: UNIX, Linux, MS-DOS, Windows and other contemporary Operating Systems.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Galvin and Silberschatz, *Operating Systems and concepts*, Addison Wesley.T
2. Tanenbaum, *Operating Systems*, PHI T
3. Stallings, *Operating systems*, PHI T

Reference Books Recommended:

1. Nutt, *Operating systems*, Addison Wesley,R
2. Colin Ritchie, *Operating systems incorporating unix and windows*, BPB publ.R
3. Bach A. S., *Design of UNIX operating system*, PHI.R

ELECTIVE - III

EC65705/CO - 6574 / CO - 7374: SOFTWARE PROJECT MANAGEMENT

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC65705	Elective-III	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

THEORY:

Computers and legal issues, Intellectual property (Copyright, patents and trademarks), computer contracts.

Software development organization and roles, Development process models.

Planning a software development effort.

Risk engineering and matrices, managing software life cycle support, Continuous process improvement.

Software Quality Management, software quality factors, quality life cycle, quality management systems, Capability Maturity Model (CMM), quality control, quality plans, and software reviews.

Estimation techniques in project management, size estimations, efforts estimates, estimate improvement techniques, function points, algorithmic cost models.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. David Bainbridge, *Introduction to Computer Law*, Pearson Education.
2. Bott F. et al, *Professional Issues in Software Engineering*, UCL
3. Hans Van Vilet, *Software Engineering, Principles and Practice*, Wiley.

Reference Books Recommended:

1. Rawlings, *Compared to what? An Introduction to Analysis and Algorithms*, Freeman and Co.
2. Kartalopoulos S. U., *Understanding neural networks and fuzzy logic*, IEEE Press.

ELECTIVE - III

EC65706/EI - 6575 / CO - 7226: VLSI AND ASIC DESIGN

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC65706	Elective-III	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

Introduction: Basic concepts of integrated circuits and manufacturing, Design fundamental for digital CMOS circuits, Design abstraction and validation.

CMOS Circuit and Logic Design: CMOS logic gate design, Basic Physical design, CMOS logic structures, Clocking structures, I/O structures, Power and Delay consideration.

System Design: CMOS chip design, standard cells, Programmable gate arrays, Design capture, simulation and verification.

Sub System Design: Data Path Operations, CMOS Subsystem design, Memory and control strategies, PLA / ROM control implementation.

CAD System and Algorithms: CAD systems, layout analysis placement and routing algorithms, Timing analysis, Optimization, logic synthesis and simulation, Testability issues.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Weste and Eshraghin, Principles of CMOS VLSI Design: A system perspective, Pearson
2. Rabaey, Digital integrated circuits, PHI.
3. Sze S.M., VLSI Technology, TMH

Reference Books Recommended:

1. Baker and Lee, CMOS circuit design layout and simulation, IEEE/PHI.
2. Pucknell D.A. & Eshraghian K., Basic VLSI Design, Systems and Circuits. PHI.
3. Perry Douglas, VHDL, III Ed, TMH.

ELECTIVE - III

EC 65701: DIGITAL SIGNAL PROCESSING

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC65701	Elective-III	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:- Engineering Mathematics, Communication Engineering, Network Analysis.

COURSE OUTCOME:-

Students should be able to:

1. Understand time and frequency domain representation of discrete time signals and systems.
2. Find the response of a discrete time system for arbitrary inputs to design DTS.
3. Compute numerically the response of DTS for finite time inputs.
4. Design and realize digital IIR, FIR filters.

THEORY:

Discrete time signals: sequences and systems, Linear time-invariant systems and their properties.

Difference equations, Frequency domain representation of discrete-time signals and systems,

Representation of sequences by Fourier transforms and respective properties.

Sampling of continuous-time signals and Z-transform, Discrete-time processing of continuous time signals, Continuous-time processing of discrete-time signals, Properties of Z-transform.

Inverse Z-transform, Inverse Z-transform using contour integration, Complex convolution theorem, Parseval's relation, Unilateral Z-transform.

Transform analysis of Linear Time-Invariant (LTI) Systems - Frequency response of LTI systems, Systems functions.

Frequency response for rational system functions, relationship between magnitude and phase, all-pass systems, Minimum-phase systems.

Structures of discrete-time systems: Signal flow graph representation of linear constant coefficient difference equations, Basic network structures for FIR systems, Design of FIR filters by windowing, Kaiser window.

Basic structures of IIR systems, Transposed forms, Design of discrete-time IIR filters from continuous-time filter, Frequency transformations of low pass IIR filters.

Discrete Fourier Transform (DFT) and its properties, Linear convolution using DFT, Computation of Discrete Fourier Transform - efficient computation of the DFT, Goertzel algorithm.

Decimation in-time FFT algorithms, Decimation-in-frequency FFT algorithms, Implementation of the DFT using convolution.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Oppenheim & Schaffer, *Digital Signal Processing*, PHI.
2. Proakis, *Digital Signal Processing*, PHI.
3. Mitra Sanjit, *Digital Signal Processing: A Computer Based Approach*, TMH.

Reference Books Recommended:

1. Sarkar N., *Digital Signal Processing*, Khanna Publishers.
2. *Schaum's Outline Series, Digital Signal Processing*.
3. Salivahanan & Vallavaraj, *Digital signal processing*,

ELECTIVE - IV

EC - 65753: FREQUENCY REGULATIONS AND THEIR MANAGEMENT

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

THEORY:

Review of various modes of radio propagation, channel characteristics of various modes of propagation - attenuation, noise, delay, various sources of noise and interference.

Traffic model for various services and their QOS requirements

History of frequency planning and regulations.

Present ITU process - Issues addressed in WRCC, Regional process with European countries case study, country processes with emphasis on Indian scenario.

Spectrum calculations based on ITU task force 8-1 and 6-8 reports.

Indian traffic model for various present and future services, spectrum management model based on future of frequency regulation and management to accommodate new services.

Case Study of National Frequency Allocation Plan (NFAP) 2002 and International Frequency Regulation Plan, Functionality of TRAI, TDSAT and WPC in Indian Spectrum Management.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Benedetto and Biglieri, *Principles of Digital Transmission with Wireless Application*, Kluwer Academic/ Plenum Publ.
2. Sergio Verdu, *Multuser Detection*, Cambridge Univ. Press.
3. David persons, *The Mobile Radio Propagation Channels*, Pentech Press, London

REFERENCE BOOKS RECOMMENDED:

1. ITU Task force 8-1, 6-8 reports.
2. Campbell A. T., *Understanding the Wireless Web Radio Channel Issues*, Lecture notes E6951, comet/columbia.edu/~campbell.
3. www.dotindia.in, www.itu.int, www.fcc.gov, wireless planning and coordination wing (Govt. of India),

ELECTIVE - IV

EC - 65751: UNIX NETWORK PROGRAMMING

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC - 65751	Elective-IV	4	-	-	4	-	70	30	-	-	100

PREREQUISITES: Operating system, Concepts of Programming language 'C', Computer networks, Network design technology

COURSE OUTCOMES:

1. Review of basic operating system concepts and understand the Unix operating system
2. Understand the basic concepts of sockets and their implementation using programming language for basic protocol designs
3. Understand the advanced features of sockets and examine these features for protocol development.
4. Understand the basics and types of process to process communication in UNIX
5. Implementation of interprocess communication using various methodologies and maintain synchronization among IPC.

THEORY:

1. Introduction: UNIX standards, 64 bit architectures, TCP/IP and ISO-OSI layered model.
2. Sockets: Introduction to ports and sockets, socket address structure, elementary TCP and UDP sockets, socket option, I/O multiplexing, case studies with client server examples.
3. Advanced Socket : IPV4 and IPV6 inter-operability, advanced name and address conversions, daemon process and interrupts, advanced I/O functions, unix domain protocols, nonblocking I/O, routing sockets, broadcasting and multicasting, Advanced UDP sockets, out of band data, concurrent and iterative servers. raw socket, XTI clients (for TCP and UDP), name and address functions, XTI servers, streams.
4. Inter Process communication : Introduction to IPC, IPC names permissions, creation and opening.
5. IPC Channels: Message passing pipes, FIFO and message queues, Synchronization with mutex and condition variables, read write locks, record locking and semaphores, shared memory. Remote procedure calls and XDR.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:

1. Richard Stevens, *Unix Network Programming vol I and II*, Pearson Edu. Asia.
2. Donahoo M. J. and Calverf K. L., *The pocket guide to TCP/IP sockets*, Morgan Kaufman.
3. Stones and Mathew, *Beginning Linux programming*, SPD Publ.

Reference Books Recommended:

1. Comer ,Internetworking with TCP/IP ,PHI
2. Black U., *TCP and related protocols*, MGH.
3. Stevens R., *TCP/IP illustrated Vol. 1*, Addison Wesley.

ELECTIVE - IV**EC65754/EE - 6583 / EE - 6353 / CO-7254: REAL TIME OPERATING SYSTEMS**

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC65754	Elective-IV	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-**COURSE OUTCOME:-**

Students should be able to:

THEORY:

Basic concepts of modern disk-based OS-shell and kernel, scheduler, examples using MSDOS, UNIX, LINUX and Windows; System Calls for Input / output.

Architecture of a simple RTOS: definition of tasks, task control, task information.

Scheduling priority, shared data problems and mutual exclusion.

Critical section implementation, Inter-task communications, semaphores, message queues, buffers, pipes.

Re-entrance issues, timer functions, interrupts and I/O.

Designing a real-time application using a practical RTOS like VxWorks, uCOS-II, eCOS or embedded Linux.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. J.J. Labrosse, *Microcos-II The Real-time Kernel*. Lawrence R&D Publications.
2. Krishna, *Real time systems*, MGH.

Reference Book Recommended :

3. Gray David, *Real time system design*, Springer.

EC65755/CO - 6584 / CO - 7373 SOFTWARE ENGINEERING

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC65755	Elective-IV	4	-	-	4	-	70	30	-	-	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

THEORY:

System Characteristics, System Life Cycle, System Methodology.

Object Oriented Concepts, Objects, Class, Instance, Polymorphism, and Inheritance.

System Development Model Architecture, Requirement Model, Analysis Model, Design Model, Implementation Model, Test Model, Block Design.

Real Time Modeling, Database Modeling, and Component Modeling.

Unit Testing, Integration Testing, System Testing, Module Testing, Components Testing.

Case Study, Watchout Management System, Telecommunication issues

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Books & References Recommended :

1. Ivar Jackbson, *Object Oriented Software Engineering*, Addison Wesley Pub.
2. Pressman, *Software Engineering*, MGH.

Elective III EC65756 : EMBEDDED SYSTEMS DESIGN

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-	30	70	40	60	200

PREREQUISITE:- Digital Electronics, Microcontroller and Microprocessors.

COURSE OUTCOMES:-

Unit-I: Introduction to embedded system, embedded system architecture, classifications of embedded systems, challenges and design issues in embedded systems, fundamentals of embedded processor and microcontrollers, CISC vs. RISC, fundamentals of Vonneuman/Harvard architectures, types of microcontrollers. Selection of a microcontroller for an application.

Unit-II: ATMEGA 8 bit microcontroller architecture Introduction to ATMEGA microcontrollers, their architecture and features, memory mapping, assembly language programming, addressing modes, instruction set.

Unit-III: I/O Programming: ATMEGA I/O ports, I/O bit manipulation programming, timers/counters, programming to generate delay and wave form generation, I/O programming, LEDs, 7segment led's, LCD and motor interfacing.

Unit IV: Serial Communication protocols: Introduction to RS232C, I2C and SPI. Interfacing of GSM, GPS, and Bluetooth modules with microcontroller.

Unit-V: Real Time Operating Systems: Basic concepts of RTOs, semaphore, interrupt routines, inter task communication, and process I/O. Introduction to DSP processors.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICAL'S:

List of Experiments

ASSESSMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS:

1. Dhananjay V. Gadre, *Programming and Customizing the AVR Microcontroller*, TMH
2. Shibu KV, *Introduction to Embedded Systems*, MGH

EC65752: MICROWAVE MEASUREMENTS AND DESIGN

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC 65752	MICROWAVE MEASUREMENTS AND DESIGN	4	-	-	4	-	70	30	-	-	100

Module 1

Review of Maxwell's Equation and boundary conditions; Transmission line theory; Green's function and integral transform techniques; Wave propagation and polarization parameters; reflection and transmission across an interface; waveguides, cavity resonators, scattering by cylinders, wedges, spheres etc.

Module 2

Transmission lines for microwave circuits; waveguides, stripline, microstrip, slot line; microwave circuit design principles; passive circuits; impedance transformers, filters, hybrids, isolators etc., active circuits using semiconductor devices and tubes, detection and measurement of microwave signals.

Module 3

Scalar and Vector potential; antenna theorems and definitions; dipole, loop, slot radiators; aperture antennas; array theorems; pattern synthesis; self and mutual impedances; scanning antennas; travelling wave antennas; antenna measurements. radiation from open ended rectangular and circular waveguides, slot antennas, microstrip antennas

Module 4

Scattering parameters of n-ports, Conductor and dielectric losses in planar transmission lines, coupled lines, multi-conductor lines, discontinuities. Various parameters of interest in RF systems: NF, IIP3, SFDR etc. Design of LNA at microwave frequencies.

Module 5

Experiments in basic microwave measurements; passive and active circuit characterization using network analyser, spectrum analyser and noise figure meter; PC based automated microwave measurements; integration of measurement and design of microwave circuits.

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Reference Books:

Field and Wave Electromagnetics : David K Cheng

Fundamentals of Microwave Engineering : Pozar

RF Microelectronics : Razavi

Antenna Analysis and Synthesis : Balanis

Time Harmonic Electromagnetic Waves : R.F Harrington

EI 65757: DESIGN OF INTEGRATED CIRCUITS

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC 65757	DESIGN OF INTEGRATED CIRCUITS	4	-	-	4	-	70	30	-	-	100

1. Physics of bipolar and MOS integrated transistors. The planar silicon process, integrated circuit resistors and capacitors. Parasitic effects in integrated circuits.
2. Layout and design criteria. Stick diagrams. Linear integrated circuits: bipolar and all-MOS OP-AMPs. Digital integrated circuits: TTL and MOS logic.
3. Design of LSI and VLSI digital circuits in nMOS and CMOS. Lambda-based design rules.
4. PLA design, DRAM and SRAM design. Output buffers. Gate array and standard cell design. Economics of IC design.
5. Computer aided design systems. Typical examples of MOS LSI design

ASSESSMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

References and text books:

- 1) Principles of CMOS VLSI Design—Neil Weste and Kamran Eshraghain
- 2) Digital Integrated Circuits-- Rabaey, Chandrakasan.
- 3) CMOS Digital Integrated Circuits—Kang, Leblebici.

EC - 65851: LAB III

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC65851	Lab-III	-	-	4	-	4	-	-	40	60	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

- 1) Install and learn the network simulator (NS2/NS3)
- 2) Develop and simulate the various network topologies with desired networking protocols
- 3) Learn and practice MATLAB simulation tool with its basic command sets.
- 4) Learn document editing tool LaTeX and write a technical report using it.
- 5) Practice on various editors of UNIX operating system.

1. Introduction and study of Various features of network simulator package (e.g. NS2) for various types of traffic generation, queuing and aggregate performance (e.g. delay, throughput, fairness, blocking etc.) writing small simulation programs, confidence level with the number of samples, measures of a simulated network. Installation of packet tracers and GNS-3 and network experiments based on these software's.

2. Report generation and its graphical presentation using report generation packages like latex (including bibtex), sltex, xfig (x mgr), gnuplot, matlab, pspice and their working knowledge, .ps, .dvi files etc., preparation for the presentation using the above packages for one of the RFC's/other topics in the seminar

3. Advanced text editors such as Vim, gvim and Correction utilities like ispell etc.

ASSESSMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

PRACTICALS:

LIST OF EXPERIMENTS

1. Installation of network simulator 2 on Linux environment.
2. Configuration of latex on window environment.
3. Problem solving process and image acquisition in MATLAB.
4. Execution of commands in VI editor.

Text Books Recommended :

1. Moris & Mcgilton, *Unix system V*, MGH
2. Kochen and Wood, *Exploring Unix system V*, PHI.
3. Buerger D. J., *Latex for engineers and scientists*, MGH.

Reference Books Recommended:

1. Bach, *UNIX system V*
2. Leslie Lamport, *Latex, a document preparation system*, Addison Wesley.
3. www.isi.edu/nsnam/ns, www-mash.cs.berkeley.edu/ns,
Mobile network simulator - www.icsi.berkeley.edu/~widmer/mnav/ns-extensions

EC - 65852: LAB IV

S.N.	Code No.	Subject	L	T	P	TH Credit	PR Credit	Maximum Marks				
								TH	CW	SW	PR	Total
1.	EC 65852	Lab-IV	-	-	4	-	4	-	-	40	60	100

PRE-REQUISITES:-

COURSE OUTCOME:-

Students should be able to:

1. Formatting and partitioning of a disc and configuring LILO.conf, Installation of linux, Window NT/2000, addition and removal of packages.
2. Configuring a machine on network and exercises on networking and subnetting, Connecting two NICs on a PC to configure it as a router/gateway, Elements of network system administration, usage of network utility commands e.g. ifconfig, traceroute for fault detection etc., pgp and its usage for message security.
3. Linux/windows network programming (socket programming).
4. Traces, Curses etc.
5. Managing a Proxy server, Filters for restricting a service like email, Blocking of a site on www. Mirroring a site.
6. Log record generation/inspection of various users.
7. Installation of a web site and record maintenance using CGI script and mysql
8. Installation of mysql, postgresql on unix for user database management and CGI interfaces for them.

ASSESSMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

PRACTICALS:

LIST OF EXPERIMENTS

1. Formatting and Partitioning of disc in Linux environment and Configuring LILO, the Linux Loader.
2. Linux Installation and Addition and Removal of Packages.
3. Configure a machine on a network on a windows platform.
4. Configuration of two NICs on a PC using Gateways.
5. Network programming by using Sockets.
6. TUI construction by curses and traces. Limitation in browsing Internet with ACM.
7. Retrieving log files and their contents.
8. Installation of Web Site for hundred users
9. Installation of MySQL on Linux.
10. Installation of PostgreSQL.
11. Experiments on data communication trainer kit.
12. Experiments on LAN trainer kit.

Text Books Recommended :

1. Moris & Mcgilton, *UNIX system V*, MGH
2. Kochen and Wood, *Exploring UNIX system V*, PHI.
3. Buerger D. J., *Latex for engineers and scientists*, MGH.

Reference Books Recommended:

1. Bach, *Unix system V*
2. Leslie Lamport, *Latex, a document preparation system*, Addison Wesley.
3. www.isi.edu/nsnam/ns, www-mash.cs.berkeley.edu/ns,
Mobile network simulator - www.icsi.berkeley.edu/~widmer/mnav/ns-extensions