



**MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI-627 012, TAMILNADU, INDIA**

CENTRE FOR INFORMATION TECHNOLOGY AND ENGINEERING

Board of Studies Meeting Held on 31.03.2016

**M.Phil. INFORMATION TECHNOLOGY
(CBCS-University Department)**

**Regulations, Scheme and Syllabus
For those who joined from the academic year 2016-2017 onwards**

**Submitted by
Chairman, BOS and Head i/c,
Centre for Information Technology and Engineering,**

to

**The Registrar
Manonmaniam Sundaranar University
Tirunelveli - 12**

MANONMANIAM SUNDARANAR UNIVERSITY
CENTRE FOR INFORMATION TECHNOLOGY AND ENGINEERING
TIRUNELVELI – 627 012, TAMILNADU, INDIA

REGULATION, SCHEME AND SYLLABUS FOR
M.Phil. INFORMATION TECHNOLOGY
(CBCS-University Department)

For those who joined from the Academic year 2016-2017 onwards

A. REGULATIONS

M.Phil. degree programme in Information Technology exposes students, the fundamental setup and latest trends of Information Technology (IT) through a set of hand-picked IT oriented subjects to pursue career in contemporary IT industry and in academics as well.

A1: Duration of the Course:

The M.Phil. programme is a 1 year full time programme spread over two semesters.

A2: Eligibility for Admission:

The minimum eligibility conditions for admission to the M.Phil. programme in Information Technology are given below.

The candidates who seek admission into the first semester of the M.Phil. programme in Information Technology course will be required to have passed the Master's degree (M.Sc./M.C.A./ equivalent) from Manonmaniam Sundaranar University or any other Indian University or equivalent, in any one of the following disciplines:

1. Information Technology
2. Networking
3. Ecommerce

4. Software Engineering
5. Information Technology & Ecommerce
6. Computer Application
7. Computer Science
8. Information Technology and Management
9. any other qualification recognized as equivalent to the above disciplines

A3: Credit Requirement for the Degree:

The general Regulations of the Choice Based Credit System programme of Manonmaniam Sundaranar University are applicable to this programme. The University requirement for the M.Phil. programme is completion of 40 credits of course work, out of which 16 credits should be through Dissertation and Viva-Voce , remaining 24 credits should be through Core and Elective papers. A typical theory course (Core/ Elective/ Supportive Course) has 8 credits. No candidate will be eligible for the Degree of Master of Philosophy in Information Technology, unless the student has undergone the prescribed courses of study for a period not less than 2 semesters and has acquired 40 credits and other passing requirements in all subjects of study.

$$\text{Consolidated Percentage of Marks} = \frac{\text{Total of (\% of Marks x Credits)}}{\text{Total Credits Acquired}}$$

A4: Specializations:

The M.Phil. degree programme in Information Technology will have two specializations, namely

Specialization A. Group - A : Image Processing and Computer Vision

Specialization B. Group – B : Communication and Networking Technologies

The degree will be offered as M.Phil. Information Technology only. However, the subjects for specialization A are offered under Group A and the subjects for specialization B are offered under Group B. A student can choose electives either from

Group A or Group B only. The subject, Dissertation and Viva-Voce is to be done in the chosen specialization only.

A5: Attendance Requirement:

A candidate will be permitted to appear for the semester examination only if the candidate keeps not less than 75 percent attendance. The University condonation rules are applicable for those who lack minimum of 75% attendance. The candidates with less than 60% attendance will have to repeat the concerned entire semester.

A6: Assessment

Semester examination will be conducted for all subjects of study, at the end of each Semester. The assessment will comprise Continuous Internal Assessment (CIA) carrying a maximum of 25% marks and end-semester Examination carrying a maximum of 75% marks in each theory subject (Core/Elective).

For Dissertation and Viva-Voce, the CIA is carried out for 75 marks and the External Assessment (Final Project Presentation, Thesis/Dissertation) is for 75 marks. Viva-Voce is carried out for 50 marks (25 marks internal and 25 marks external). The student will be tested for his understanding of basic principles of the core Specializations. The internal assessment for a total of 75 marks will be made by Project Supervisor. The Project Supervisor will conduct three reviews in each level of progress. On completion of the work, a Thesis/Dissertation should be prepared in the prescribed format and submitted to the department. The Dissertation presentation and Viva-Voce examination is conducted by a committee of one external examiner and one internal examiner appointed by the HOD/Professor/ Co-ordinator of Students' Project works

A7: Passing Requirements

A candidate who secures not less 50 percent marks in end-semester Examination and not less than 50 percent of the total marks (Continuous Internal Assessment + end-semester Examination) in any subject of study will be declared to have passed the subject.

A Candidate who successfully completes the course and satisfies the passing requirements in all the subjects of study and curricular requirements will be declared to have qualified for the award of the Degree.

A8: Classification of successful candidates

The candidates who passed written papers, practical papers and Projects shall be classified as follows. Total Marks secured in written papers, practical papers and Project work altogether put as overall percentage along with the credits.

The classification is as follows,

Marks Overall %	Classification
1. 60% and above	I Class
2. 50% to below 60%	II Class

A9. Power to Modify

The University may from time to time revise, amend or change the regulations, scheme of examinations and syllabus, if found necessary and such amendments, changes shall come into effect from the date prescribed.

These regulations will come into effect from the academic year 2016-2017 onwards.

B. SCHEME OF EXAMINATION

M.Phil. in Information Technology (CBCS) - FULL - TIME

(Joined July 2016-2017 onwards)

Duration: ONE YEAR (Two Semesters – 40 Credits)

Sem	Title of the Subject	Status*	Hrs/week	Credits	Maximum Marks				Passing Minimum	
					Int	Ext	Viva - Voce	Total	Ext	Total
FIRST SEMESTER										
I	Research Methodology	C	8	8	25	75	--	100	50	50
I	Elective	E	8	8	25	75	--	100	50	50
				I Semester total credits						
SECOND SEMESTER										
II	Elective 2	E	8	8	25	75	--	100	50	50
II	Dissertation and Viva Voce	D	16	16	75	75	50	200	50%	50%
				II Semester total credits						
				OVERALL TOAL CREDITS						

* C – Core, E – Elective, D –Dissertation

Sl.No.	Title of the Subject	Status*	Hrs/week	Credits	Maximum Marks				Passing Minimum	
					Int	Ext	Viva-Voce	Total	Ext	Total
GROUP A: Subjects for Electives under Specialization A: Image Processing and Computer Vision										
A1	Advanced Digital Signal and Image Processing	E	8	8	25	75	--	100	50	50
A2	Pattern Recognition and Image Analysis	E	8	8	25	75	--	100	50	50
A3	Artificial Neural Networks	E	8	8	25	75	--	100	50	50
A4	Fuzzy Logic and Engineering Applications	E	8	8	25	75	--	100	50	50
A5	Data Compression	E	8	8	25	75	--	100	50	50
A6	Robotics	E	8	8	25	75	--	100	50	50

GROUP B: Subjects for Electives under Specialization B: Communication and Networking Technologies										
B1	Modern Communication System	E	8	8	25	75	--	100	50	50
B2	Network Design	E	8	8	25	75	--	100	50	50
B3	High Performance Computing Networks	E	8	8	25	75	--	100	50	50
B4	Pervasive, Grid and Cloud Computing	E	8	8	25	75	--	100	50	50
B5	Mobile and Cellular Computing	E	8	8	25	75	--	100	50	50
B6	Network Programming	E	8	8	25	75	--	100	50	50
B7	Network Security	E	8	8	25	75	--	100	50	50

C.SYLLABUS FOR M.Phil. (INFORMATION TECHNOLOGY)

Core	RESEARCH METHODOLOGY
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Unit I:

Basic research methodology: Objectives and Motivation in Research - Types of Research - Approaches and Significance of Research - Research Methodology versus Research Methods - Research Process-Finding a Research Advisor/Guide, What to Look for in a Potential Research Advisor/Guide, How to Find an Advisor/Guide, The Advisor-Advisee Relationship; Finding a Topic and Beginning Research, Getting Research Ideas, How to be an Active Reader and Listener, Getting Exposed to Research, Directed Study; Formulating the Research Problem: Develop the Nucleus of an Idea, Extensive Literature Survey: A Trap to Avoid, Choosing an Idea, Stay Active - Measure of Good Research - Common Problems for Researchers.

Unit II:

Overview of the Theory of Science and history of scientific research - Overview of Research Methodology for Engineering Research - Science versus Engineering - Distinct perspectives of goals Research methodology for circuit branches: Formulating the Research Problem - Research Design - Evolution of Computing Research.

Unit III:

Research Methods for Engineering Research - History of ideas in computing - Measurements based research methods in computer engineering - Measurements based research methods in Signal and Image Processing, Graphics, Vision and Pattern Recognition - Deductive Methods in Computing Science.

Unit IV:

Deductive Methods in Signal and Image Processing, Graphics, Vision and Pattern Recognition - Inductive Methods in Computing Science - Inductive Methods in Signal and Image Processing, Graphics, Vision and Pattern Recognition - Building Models – Simulation.

Unit V:

Searching for scientific papers - Writing and presentation of a research paper for a conference or journal - Review and opposition of engineering/scientific research papers - Writing a good thesis: Research report writing - Converting your research thesis into a monograph - Research education, the research society and research policy

TEXT BOOK:

1. Lecture Notes by Prof.Dr.Krishnan Nallaperumal on “Engineering Research Methodology - A Computer Science and Engineering and Information Technology Perspective.

REFERENCES BOOKS:

1. “Thesis & Assignment Writing” By Anderson, Berny H. Dujrston, H. Pode, Wiley Eastern Ltd., New Delhi.
2. “Research Methodology” R. Panneerselvam, PHI, New Delhi 2005
3. C. R. Kothari – Research Methodology Methods and Techniques - Wishwa Prakashan Publishers – Second Edition.
4. Dr. Rajammal, P. Devadas – A Handbook on Methodology of Research – Sri Ramakrishna Mission Vidyalaya College of Rural Higher Education.
5. Scientific Social Surveys and Research - Young Pauline. V.

DISSERTATION AND VIVA VOCE

Objective of this course is to facilitate transfer of knowledge acquired by a student to a field of his chosen specialization for application to solving a problem. The Co-ordinator of Students’ Project works from the department shall coordinate this course. Student is expected to collect and study relevant material under mentorship of a Project Supervisor, identify a suitable problem and propose methodology towards its solution. Alternately a student can explore hardware / software implementation of existing solution(s).

The student will be tested for his understanding of basic principles of the core Specializations. The internal assessment will be made by Project Supervisor. The Project Supervisor will conduct three reviews in each level of progress. On completion of the work, a thesis report should be prepared in the prescribed format and submitted to the department. The end-semester university examination, will have a thesis presentation and

Viva-Voce examination conducted by a committee of one external examiner and one internal examiner appointed by the HOD/Professor/ Co-ordinator of Students' Project works.

GROUP A: SUBJECTS FOR ELECTIVES UNDER SPECIALIZATION A

A1	ADVANCED DIGITAL SIGNAL AND IMAGE PROCESSING
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UNIT I

Signals and signal Processing, characterization & classification of signals, typical Signal Processing operations, example of typical Signals, typical Signals Processing applications. Time Domain Representation of Signals & Systems- Discrete Time Signals, Operations on Sequences, Linear shift-invariant systems, Stability and Causality, Linear constant coefficient difference equations, Frequency domain representation of discrete-time systems, symmetry properties of the Fourier transform, Sampling of continuous-time systems. Z-transforms, Discrete Fourier Transform (DFT) & its properties, computation of the DFT of real sequences

UNIT II

Digital Image Fundamentals: Fundamental steps in Image Processing –Components of Image Processing System-Image Sampling and Quantization-Basic Relationships between Pixels. Image Enhancement in Spatial Domain: Basic Gray level Transformations-Histogram Processing- Enhancements using Arithmetic/logic Operations-Basics of Special Filtering-Smoothering Filters-Sharpener Filters.

UNIT III

Image Enhancements in the Frequency domain : Smoothering Filters-Sharpener Filters-Homomorphc Filters - Image Restoration: Degradation model –Noise Models-Restoration in the presence of Noise- Wiener Filter. Color Image Processing : Color Fundamentals-Color Models-Basics of full Color image Processing-Color Transformations.

UNIT IV

Wavelets and Multi-resolution Processing: Image Pyramids and Sub band Coding – Wavelet Transform in one dimension- FWT. Image Compressions: Fundamentals – Image Compression models – Elements of Information Theory – Error – Free Compression – Lossy compression – Image Compression standards.

UNIT V

Image segmentation: Detection of discontinuities – Edge linking and Boundary detection –Thresholding – Region Orientation Segmentation – use of motion in segmentation. Morphological Image Processing: Basic Binary morphological Operations. Basic grayscale morphological Operations. Representation and Description: Representation-Boundary Descriptors.

References:

1. Refael C. Gonzalez & Richard E. Woods - Digital Image Processing, Addison Wesley publication corporation, 2008
2. Image Processing Analysis, and Machine Vision, Milan Sonka,
3. Alan V. Oppenheim & Ronald W. Schafer, “ Digital Signal Processing” PHI, 2002
4. Sanjit K. Mitra, “ Digital Signal Processing: A computer based approach” TMH, Second Edition, 2003.

A2	PATTERN RECOGNITION AND IMAGE ANALYSIS
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UNIT I

Introduction: Machine perception, pattern recognition example, pattern Recognition systems, the design cycle, learning and adaptation - Bayesian Decision Theory: Introduction, continuous features – two categories classifications, minimum error-rate classification-zero-one loss function, classifiers, discriminant functions, and decision surfaces.

UNIT II

Normal density: Univariate and multivariate density, discriminant functions for the normal density-different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context Maximum likelihood and Bayesian parameter estimation: Introduction, maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation–Gaussian case.

UNIT III

Un- supervised learning and clustering: Introduction, mixture densities and identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Data description and clustering – similarity measures, criteria function for clustering - Pattern recognition using discrete hidden Markov models - Discrete-time Markov process, Extensions to hidden Markov models, three basic problems of HMMs, types of HMMs.

UNIT IV

Continuous hidden Markov models: Continuous observation densities, multiple mixtures per state, speech recognition applications - Digital image models, sampling and quantization, basic relationships between pixels, image geometry. Image enhancement: Back ground, enhancement by point processing histogram processing, spatial filtering, introduction to image transforms, image enhancement in frequency domain.

UNIT V

Image Segmentation and Edge Detection: Region Operations, Crack Edge Detection, Edge Following, Gradient operators, Compass and Laplace operators. Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures; edge based image segmentation- edge image thresholding, edge relaxation, border tracing, border detection, image morphology, image security.

Text Books:

1. Richard O. Duda, Peter E. Hart, David G. Stroke, Pattern Classifications, Wiley.
2. Lawrence Rabiner, Biing – Hwang Juang Fundamentals of Speech Recognition, Pearson
3. Gonzalez R.C & Woods R.E., Digital Image Processing, Addison Wesley, 1992.

Reference Books

1. Jain A.K., Fundamentals of Digital Image Processing, Prentice Hall of India.
2. Reddy M.Anji, Digital Image Processing, BS Publications.

A3	ARTIFICIAL NEURAL NETWORKS
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UNIT – I:

Introduction to Neural Networks: Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

UNIT- II:

Essentials of Artificial Neural Networks: Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules. Single Layer Feed Forward Neural Networks: Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model.

UNIT- III:

Multilayer feed forward Neural Networks: Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements. Associative Memories: Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function.

UNIT IV:

Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis. Classical & Fuzzy Sets: Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT V:

Fuzzy Logic System Components Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets,

Defuzzification methods. Applications Neural network applications: Process identification, control, fault diagnosis. Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

TEXT BOOK:

1. S. Rajasekharan and G. A. Vijayalakshmpai, “Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications”, PHI Publication, 2004.
2. John Yen and Reza Langan, “Fuzzy Logic: Intelligence, Control and Information”, Pearson Education,2004.

REFERENCE BOOKS:

1. Simon Haykin, “Neural Networks- A comprehensive foundation”, Pearson Education, 2001.
2. S.N.Sivanandam, S.Sumathi,S. N. Deepa “Introduction to Neural Networks using MATLAB 6.0”, TMH, 2006.
3. James A Freeman and Davis Skapura, Neural Networks Pearson Education, 2002.
4. Timothy J. Ross, “ Fuzzy Logic With Engineering Applications”, McGraw-Hill Inc. 1997.

A4	FUZZY LOGIC AND ENGINEERING APPLICATIONS
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UNIT I

Introduction: background- uncertainty and imprecision-statistics and random processes-uncertainty in information-fuzzy sets and membership –chance verus ambiguity - Classical sets and fuzzy sets:- classical sets- operations on classical sets –properties of classical (crisp) sets – mapping of classical sets to functions fuzzy sets- fuzzy set operations-properties of fuzzy sets sets as points in hypercubes.

UNIT II

Fuzzy to crisp conversions: - lambda-cuts for fuzzy sets-lambds-cuts for fuzzy relations-defuzzification methods. Fuzzy arithmetic, numbers, vectors and the extension principle:- extension principle crisp functions, mapping and relations functions of fuzzy sets – extension principle fuzzy transform- practical considerations fuzzy numbers- interval analysis in arithmetic –approximate methods of extension –vertex method –DSW algorithm –restricted DSW algorithm comparisons-fuzzy vectors.

UNIT III

Classical logic and fuzzy logic:- classical predicate logic –tautologies –contradictions-equivalence-exclusion Or an exclusive Nor –logical proofs –deductive inferences fuzzy logic- approximate reasoning –fuzzy tautologies, contradictions equivalence and logical proofs-others forms of the implication operation-other forms of the composition operation. Fuzzy rule based systems: natural languages-linguistic hedges- rule based systems canonical rule forms- decomposition of compound rules –likelihood and truth qualification- aggrefic of fuzzy rules –graphical techniques of inference.

UNIT IV

Fuzzy nonlinear simulation: - fuzzy relational equations-partitioning-nonlinear simulation using fuzzy rule based systems –fuzzy associative memories (FAMs) - Fuzzy decision making: fuzzy synthetic evaluation –fuzzy ordering –preference and consensus-multi objective decision making-fuzzy Bayesian decision method-decision making under fuzzy states and fuzzy actions.

UNIT V

Fuzzy classification: Classification by equivalence relations –crisp relations-fuzzy - elations-clusters analysis-cluster validity-c-means clustering –hard c-means(HCM)-fuzzy c-means (FCM)-classification metric-hardening the fuzzy c-partition-similarity relations from clustering - Fuzzy pattern recognition:- features analysis-partitions of the features space-single sample idenfication0multifeature pattern recognition –image processing-syntatic recognition –formal grammar-fuzzy grammar and syntactic recognition.

Text Book:

Fuzzy logic and Engineering applications – Timothy J.Ross,2009.

A5	DATA COMPRESSION
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UNIT I

Types of data redundancies, Concepts of Information theory, Shannon's 1st Theorem, Importance of Multi-resolution Analysis, Discrete Fourier Transform, Discrete Cosine Transform, Discrete Wavelet Transform- Implementation and Importance.

UNIT II

Lossless Compression- Run length coding, Huffman Coding, Applications of Huffman Coding for Text and Audio Compression, Arithmetic Coding, Comparison of Huffman and Arithmetic Coding, Binary and Arithmetic Coding

UNIT III

Dictionary techniques-Static Dictionary, Adaptive Dictionary, LZ coding approaches, Applications of LZ approaches for File and Image Compression.

Context based techniques-Prediction with Partial Match, Move to Front Coding based on Burrows Wheeler Transform

UNIT IV

Quantization techniques- Scalar Quantization, Forward and Backward Adaptive Quantization, Vector Quantization, Advantages of Vector Quantization over Scalar Quantization, The LBG algorithm

UNIT V

Lossy Compression and Compression Standards- Lossy predictive coding, Transform Coding, Wavelet coding, JPEG, MPEG4.

REFERENCES

1. Introduction to Data Compression, Fourth Edition, Khalid Sayood, 2011
2. Anil K. Jain: Fundamentals of Digital Image Processing, Prentice Hall, 1989.
3. Rafael C. Gonzalez and Richard E. Woods: Digital Image Processing, Addison-Wesley, 1992
4. <http://tcs.rwth-aachen.de/lehre/Komprimierung/SS2012/ausarbeitungen/H264-PEG4.pdf>

A6	ROBOTICS
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UNIT-I:

Introduction: Definition, Classification of Robots, geometric classification and control classification. Robot Elements: Drive system, control system, sensors, end effectors, gripper actuators and gripper design.

UNIT-II:

Robot Coordinate Systems and Manipulator Kinematics: Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.

UNIT-III:

Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.

UNIT-IV:

Robot Control: Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Servo system for robot control, and introduction to robot vision.

UNIT-V:

Robot Programming: Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handling, assembly operations, collision free motion planning. Applications: Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

TEXT/REFERENCE BOOKS:

1. Coifet Chirroza, "An Introduction to Robot Technology" Kogan Page.
2. Y. Koren "Robotics for Engineers" McGraw Hill.
3. K. S. Fu, R.C. Gonzalez Y & CSG Lee, "Robotics" McGraw Hill.
4. J.J. Craig, "Robotics" Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, "Industrial Robots" McGraw Hill.
6. Asfahl, "Robots & Manufacturing Automation" Wiley Eastern.

GROUP B: SUBJECTS FOR ELECTIVES UNDER SPECIALIZATION B

B1	MODERN COMMUNICATION SYSTEMS
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UNIT-I: Network Evolution – The ISDN – The Basic Rate ISDN customer’s Interface: The customer’s Installation layer 1, 2, 3. Primary rate ISDN access: background – signaling – evaluation of PABX signaling – International standards for inter – PABX signaling.

UNIT-II: Frame mode services: Store and Forward Switching – Data grams and Virtual Circuits - Flow and Congestion Control – New ISDN Frame mode Services – Frame Format. ISDN Customer premises Equipment and Applications: High quality speech – Music coding FACSIMILE – Photographs Video tex – Video – Audio Visual services and Embedded – Customer premises Equipment.

UNIT-III: ATM Network concepts and Architecture: ATM’s position in the OSI Reference Model – B-ISDN protocol reference model – ATM functions and layers – ATM signaling principles – The ATM layer – ATM switching principles.

UNIT-IV: Modern Communication: Fundamentals of Information Handling – Information media as viewed from the Human Interface – Various facets of modern Communication systems – Composition of Modern Communication systems.

UNIT-V: Components of modern Communication systems: Home systems – Home system image – Home systems and their service Trends – Access systems for Home systems. Business Communications: Basic structure of the Office system in a single office / Plant – Basic Structure of the Office system connected to WAN’s. The general structure of the office system – Actual Composition of CAN and WAN. Mobile Communication in the information society- Technical Background of Mobile Communication various Mobile Communications services – Positioning of VAN – Classification by service operation mode – Classification of VAN purpose – Classification of specific Industry service type VAN’s from the added value viewpoint – New Electronic Media. Construction of Global Infrastructure: Satellite Communications systems – TV Broadcasting – Approaches to meeting new goals – Possibilities of new Broadcasting forms – Information service center systems – Automatic Interpretation telephone systems – Teleconferencing systems.

TEXT BOOKS:

1. “ISDN Explained” John M.Griffiths 2nd Edition March 1995 John Willey & sons. (Unit I & Unit II)
2. “Introduction to ATM Networking” Walter J. Goralski J. McGraw Hill Inc. (Unit III)
3. “Computers and communications” Koji Kobayashi the MID Press 1986. (A version of c and C). (Unit IV & Unit V)

B2	NETWORK DESIGN
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UNIT-I:

Essentials of Probability - Probability on a Sample Space, Basic Operations on Events, Probability on Events, Other Properties, Conditional Probability, Bayes Formula, Independence, Random Variables, Random Variable as a Measurement, Probability Mass Function for a Random Variable, Cumulative Distribution Function, PMF and CDF for the 3 CoinToss Example, Expectation of a Random Variable, Important Random Variables, Bernoulli Random Variable, Binomial Random Variable, Geometric Random Variable, Poisson Random Variable, Continuous-valued Random Variables, Properties of Continuous Random Variables, Expectation of a Continuous Random Variable, Important Continuous Random Variable: Exponential, Memory less Property of the Exponential.

UNIT-II:

Delay Models in Data Networks Multiplexing of Traffic on a Communication Link, Queuing Models- Little's Theorem, Little's Theorem, Probabilistic Form of Little's Theorem, Application of Little's Theorem, The M/M/1 Queuing System, Arrival Statistics, Service Statistics, Markov Chain Formulation, Deviation of the Stationary Distribution, Occupancy Distribution upon Arrival, Occupancy Distribution upon Departure, The M/M/m, M/M/ μ , M/M/m/m, AND Other Markov Systems, The M/M/m: The m-Server Case, M/M/ μ : The Infinite-Server Case, M/M/m/m: The m-Server Loss System, multidimensional Markov Chains- Applications in Circuit Switching, The M/G/1 System, M/G/1 Queues with Vacations, Reservations and Polling, Priority Queuing.

UNIT-III:

Inside an IMP Queuing in the Network Layer at an IMP, Basic Single Queue Model, Applications of Queuing Analysis Outside of Networking, The Poisson Arrival Model, Properties of a Poisson Process, Inter arrival Times of a Poisson Process, The M/M/1 Queue, Aside: Queuing Notation, Aside: The D/D/1 Queue, State Analysis of an M/M/1 Queue, Balance Equations, Solving the Balance Equations, The Finite Buffer Case: M/M/1/N, Blocking Probability and the Right Size Buffer, Throughput in the Finite Buffer Case, Approximation of a Finite Buffer System by the Infinite Buffer Model, Little's Formula and Queuing Delay, Applying Little's Formula to an M/M/1 Queue, Applying the M/M/1 Results to a Single Network Link, Other Queuing Models.

UNIT-IV:

Network Design - Problem definition: Multipoint line layout heuristics, CMST algorithm, ESAU William's algorithm, Sharma's algorithm, Unified algorithm, Bin packing, Terminal assignments, Concentrator location.

UNIT-V:

Network Analysis: Queuing Networks, Closed Queuing Network Example, Nodes in a Packet Switched Network (PSN), Queuing Network Model of Nodes in a PSN, Queuing Network Analysis of a PSN, performance analysis of Data Link Layer, Network layer,

QoS, Network Administration: Functions and responsibilities, Network planning and implementation, Sub-netting, Bandwidth management, security issues, Tools for BW and security management, modifying network implementation.

REFERENCES:

1. Kershenbaum A., “Telecommunication Network Design Algorithms”, Tata McGraw Hill.
2. Keshav S., “An Engineering Approach to Computer Networking,” Addison-Wesley,1997.
3. Bertsekas D. and Gallager R.,“Data Networks,”2nd Ed., Prentice-Hall, Englewood Cliffs, N.J., 1992.
4. Vijay Ahuja, “Design and Analysis of Computer Communication Networks”, McGraw Hill
5. Stallings W., “High Speed Networks and Internet : Performance and Quality of Service”, Prentice-Hall.
6. Zacker, “Networking – The Complete Reference”, Tata McGraw Hill

B3	HIGH PERFORMANCE COMPUTING NETWORKS
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UNIT I - HIGH SPEED NETWORKS

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

UNIT II - WDM OPTICAL NETWORKS

Introduction to Optical Networks – Wavelength Division Multiplexing (WDM) – Introduction to broadcast and select networks – switch architectures – channel accessing – Wavelength routed networks – switch architectures – Routing and wavelength assignment – Virtual topology design – IP over ATM over WDM – IP over WDM.

UNIT III - TCP, ATM CONGESTION CONTROL AND TRAFFIC MANAGEMENT

Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control. TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN’s Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.

UNIT IV - INTEGRATED AND DIFFERENTIATED SERVICES

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

UNIT V - PROTOCOLS FOR QOS SUPPORT

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

TEXT BOOK

1. William Stallings, “HIGH SPEED NETWORKS AND INTERNET”, Pearson Education, Second Edition, 2002.

REFERENCES

1. Warland & Pravin Varaiya, “HIGH PERFORMANCE COMMUNICATION NETWORKS”, Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
2. Irvan Pepelnjk, Jim Guichard and Jeff Aparcar, “MPLS and VPN architecture”, Cisco Press, Volume 1 and 2, 2003
3. C. Siva Ram Murthy and Mohan Gurusamy, “WDM Optical Networks: Concepts, Design and Algorithms”, Prentice-Hall of India, 2002. (UNITs IV & V)
4. Fred Halsall, “Multimedia Communications – Applications, Networks, Protocols”, Pearson Edition, 2001. (UNIT V)

B4	PERVASIVE, GRID AND CLOUD COMPUTING
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UNIT-I:

Pervasive Computing Infrastructure-Applications-Device Technology- Hardware, Human-Machine Interfaces, Biometrics, And Operating Systems- Device Connectivity-Protocols, Security , And Device Management-Pervasive Web Application Architecture-Access From PCs And PDAs- Access Via WAP

UNIT-II:

Grids and Grid Technologies, Programming models - A Look at a Grid Enabled Server and Parallelization Techniques – Grid applications- Grid architecture – Grid architecture and relationship to other Distributed Technologies – computational and data Grids, semantic grids

UNIT – III:

Grid Management systems, security, Grid Grid-Enabling software and Grid enabling network services, Data Grid - Virtualization Services for Data Grids,

Peer-to-Peer Grids - Peer-to-Peer Grid Databases for Web Service Discovery and application execution.

UNIT-IV:

Introduction to Cloud Computing- Definition, Characteristics, Components- Cloud provider- Administering & Monitoring cloud services-benefits and limitations- Deploy application over cloud- Introduction to Cloud Technologies: SOAP, Webservices, AJAX and mashups, Virtualization Technology, Multitenant software.

UNIT-V:

Cloud Relational databases- Cloud file systems- Cloud computing security architecture- Cloud computing security challenges- Issues in cloud computing- Cloud Middleware- Mobile Cloud Computing- Inter Cloud issues.

TEXT BOOK:

1. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)
2. Enterprise Cloud Computing by GautamShroff,Cambridge
3. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India
4. Jochen Burkhardt, pervasive computing: Technology and Architecture of Mobile Internet Applications, Addison-Wesley Professional; 3rd edition, 2007

REFERENCES:

1. Fran Beramn, Geoffrey Fox, Anthony Hey J.G., "Grid Computing: Making the Global Infrastructure a Reality", Wiley, USA, 2003.
2. Joshy Joseph, Craig Fallenstein, "Grid Computing", Pearson Education, New Delhi, 2004.
3. Ian Foster, Carl Kesselman, "The Grid2: Blueprint for a New Computing Infrastructure". Morgan Kaufman, New Delhi, 2004.
4. Ahmar Abbas, "Grid Computing: Practical Guide to Technology andApplications", Delmar Thomson Learning, USA, 2004.

B5	MOBILE AND CELLULAR COMPUTING
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UNIT I WIRELESS COMMUNICATION FUNDAMENTALS

Introduction - Wireless transmission - Frequencies for radio transmission - Signals - Antennas - Signal Propagation - Multiplexing - Modulations - Spread spectrum - MAC - SDMA - FDMA - TDMA - CDMA - Cellular Wireless Networks.

UNIT II TELECOMMUNICATION NETWORKS

Telecommunication systems - GSM - GPRS - DECT - Satellite Networks - Basics - Parameters and Configurations - Capacity Allocation - FAMA and DAMA - Broadcast Systems - DAB - DVB.

UNIT III WIRELESS LAN

Wireless LAN - IEEE 802.11 - Architecture - services - MAC - Physical layer - IEEE 802.11a - HIPERLAN - Blue Tooth.

UNIT IV MOBILE NETWORK LAYER

Mobile IP - Dynamic Host Configuration Protocol - Routing - DSDV - DSR - Alternative Metrics.

UNIT V TRANSPORT AND APPLICATION LAYERS

Traditional TCP - Classical TCP improvements - WAP- Introduction to 4G mobile networks- Case study - Mobile multimedia networks.

Text Books

1. Jochen Schiller, “Mobile Communications”, PHI/Pearson Education, Second Edition, 2003.
2. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education, 2002.
3. Mobile cellular Telecommunications – W.C.Y.LEE, TMH, 2nd Edition, 2006.
4. Principles of mobile Communications – Gordon L. Stuber, Springer International, 2nd edition, 2007.
5. Wireless Communications – T.S.Rapport, Pearson Education, 2nd edition, 2002.

Reference Books

1. Wireless mobile Communications – Lee, McGrahill, 3rd Edition, 2006.
2. Wireless Communication and networking – J.W.Mark and WeihulaZhqung, PHI, 2005.
3. Wireless Communication Technology, R.Blake, Thompson Asia, Pvt Ltd, 2004.
4. Jochen Schiller, “Mobile Communications”, PHI/Pearson Education, Second Edition, 2003.
5. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education, 2002.
6. KavehPahlavan, PrasanthKrishnamoorthy, “Principles of Wireless Networks”, PHI/Pearson Education, 2003.
7. Uwe Hansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, New York, 2003.
8. HazysztofWesolowshi, “Mobile Communication Systems”, John Wiley and Sons Ltd, 2002.

B6	NETWORK PROGRAMMING
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Unit I

Introduction to Systems Programming: Files, System Files, File Formats, Buffered I/O, Directories, File System, Inodes, links, fcntl, links, locks, Device I/O, Terminal I/O, ioctl(), Files and Devices ,Signals, video I/O ,Multi-Tasking

Unit II

Processes and Inter-Process Communication: timers, polling vs interrupts, environment, fork, exec, wait, environment, exit and wait, pipe, fifos, message queues, semaphore

Unit III

Network Programming: Sockets, Operation, Socket types, Domains Name Binding, using Sockets, I/O Multiplexing, Client/Server Models, Connection Based Services,

Unit IV

Handling out of Band Data, Connectionless Services, Design issues of Concurrent and Iterative servers, Socket options

Unit V

XDR and Remote Procedure Calls, Network Programming at the level of Programming Language (can use Java or Python as case study)

TEXT BOOK:

1. Unix Network Programming, W. Richard Stevens, Prentice Hall, 1998

REFERENCES:

1. Internetworking with TCP/IP, Volume3, Douglas Comer, Prentice Hall, 2000
2. Internetworking with TCP/IP, Volume1, Douglas Comer, Prentice Hall, 2000

B7	NETWORK SECURITY
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Unit I

Introduction: Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security. Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations. Algorithms: Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST -128, RC2, Characteristics of Advanced Symmetric block ciphers.

Unit II

Conventional Encryption: Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation. Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.

Unit III

Number theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's - Theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, discrete logarithms. Message authentication and Hash functions: Authentication

requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

Unit IV

Hash and Mac Algorithms: MD File, Message digests Algorithm, Secure Hash Algorithm, RIPEMD- 160, and HMAC. Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards. Authentication Applications: Kerberos, X.509 directory Authentication service, Electronic Mail Security: Pretty Good Privacy, S/MIME.

Unit V

IP Security: Over view, Architecture, Authentication, Encapsulating Security Payload, Combining security Associations, Key Management, Web Security: Web Security requirements, secure sockets layer and Transport layer security, Secure Electronic Transaction. Intruders, Viruses and Worms: Intruders, Viruses and Related threats, Fire Walls: Fire wall Design Principles, Trusted systems.

Text Books

1. William Stallings, Cryptography & Network Security: Principles and Practice, Pearson.
2. Stallings William, Network Security Essentials (Applications and Standards), Pearson Education.

Reference Books

1. Maiwald Eric, Fundamentals of Network Security, Dreamtech.
2. Char lie Kaufman, Radia Perlman & Mike Speciner, Network Security - Private Communication in a Public World, Pearson/PHI.
3. Whitman, Principles of Information Security, Thomson