

DEPARTMENT OF INFORMATION TECHNOLOGY
NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR

Course	Code	L	T	P	Credits
Green Computing	IT E01	3	1	0	4

UNIT I

GREEN COMPUTING FUNDAMENTALS:

Energy-efficient, power efficient and thermal aware computing and communication, Newton's cooling model and basic thermodynamics and sustainability.

UNIT II

MIDDLEWARE SUPPORT FOR GREEN COMPUTING:

Power states, voltage and frequency scaling, ACPI support for LINUX and Windows, Compiler optimisation, Virtualisation and server consolidation.

UNIT III

TOOLS FOR MONITORING:

Sensor networks, cooling equipments and their behaviour.

UNIT IV

HPC COMPUTING:

Hadoop, Map-Reduce, Dynamic thermal-aware scheduling, resource management in virtualised environment, embedded computing and networking, optimising for minimising battery consumption, safe and sustainable cyber-physical systems (Medical devices).

UNIT V

MANAGEMENT FRAMEWORKS:

Standards and metrics for green computing.

Text Books:

Green Computing and Green IT Best Practices by *Jason Harris*

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Course	Code	L	T	P	Credits
Management Information Systems	IT E02	3	1	0	4

Unit I

MANAGING THE DIGITAL FIRM:

Why information systems – contemporary approaches to information systems – new role of information systems- major types of systems in organizations – systems from a functional perspective – enterprise applications – organizations and information systems – managers decision making and information systems – information systems and business strategy.

UNIT II

DESIGNING INFORMATION SYSTEMS:

Systems as planned organizational change – business process re-engineering and process improvement

Overview of systems development – alternate system – Building approaches – Understanding the business value of Information Systems - The importance of change management in information system success and failure – Managing Implementation.

UNIT III

DEVELOPMENT AND MAINTENANCE OF INFORMATION SYSTEMS:

Systems analysis and design – System development life cycle – Limitation – End User Development, Managing End Users – off-the shelf software packages – Outsourcing – Comparison of different methodologies.

UNIT IV

KNOWLEDGE MANAGEMENT, ETHICS AND SECURITY:

Knowledge Management in the organization – Information and Knowledge base systems – Decision - support systems – Understanding ethical and Social issues packed to systems – Ethics in an Information society – The moral dimensions of Information Systems – System vulnerability and abuse – Creating a control environment – Ensuring System Quality.

UNIT V

INFORMATION ARCHITECTURE:

Defining Information Architecture – why Information Architecture matters – Practicing Information Architecture in the Real world – Information Ecologies – User needs and Behavior – The anatomy of Information Architecture – Organizing Systems – Search Systems.

Text Books:

1. Lauaon Kenneth & Landon Jane, "Management Information Systems: Managing the Digital firm".
2. Uma G. Gupta, "Management Information Systems – A Management Prespective", Galgotia publications Pvt., Ltd.
3. Louis Rosenfel and Peter Morville, "Information Architecture for the World wide Web", O'Reilly Associates.

Reference Books:

1. Steven Alter, "Information Systems – A Management Perspective".
2. Uma Gupta, "Information Systems – Success in 21st Century".
3. Robert G. Murdick, Joel E. Ross and James R. Claggett, "Information Systems for Modern Management".

Course	Code	L	T	P	Credits
Digital Signal Processing	IT E03	3	1	0	4

UNIT I

SIGNALS AND SYSTEMS:

Basic elements of digital signal Processing –Concept of frequency in continuous time and discrete time signals – Sampling theorem –

Discrete time signals. Discrete time systems – Analysis of Linear time invariant systems –Z transform – Convolution and correlation.

UNIT II

FAST FOURIER TRANSFORMS:

Introduction to DFT – Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 and Radix-4 FFT algorithms –Decimation in Time – Decimation in Frequency algorithms –Use of FFT algorithms in Linear Filtering and correlation.

UNIT III

IIR FILTER DESIGN:

Structure of IIR – System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance. Bilinear transformation – Approximation derivatives – Design of IIR filter in the Frequency domain.

UNIT IV

FIR FILTER DESIGN:

Symmetric & Antisymmetric FIR filters – Linear phase filter – Windowing technique – Rectangular, Kaiser windows – Frequency sampling techniques – Structure for FIR systems.

UNIT V

FINITE WORD LENGTH EFFECTS:

Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representation – comparison – over flow error – truncation error – co-efficient quantization error -limit cycle oscillation – signal scaling – analytical model of sample and hold operations – Application of DSP – Model of Speech Wave Form – Vocoder.

Text Books:

1. John G Proakis and Dimtris G Manolakis, “Digital Signal Processing Principles, Algorithms and Application”, PHI/Pearson Education

Reference Books:

1. Alan V Oppenheim, Ronald W Schafer and John R Buck, “Discrete Time Signal Processing”, PHI/Pearson Education
2. Johny R.Johnson, “Introduction to Digital Signal Processing”, Prentice Hall of India/Pearson Education
3. Sanjit K.Mitra, “Digital Signal Processing: A Computer – Based Approach”, Tata McGraw-Hill,

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Course	Code	L	T	P	Credits
Embedded Systems	IT E04	3	1	0	4

Unit I

INTRODUCTION:

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Unit II

MICROCONTROLLERS:

8051 Processor Architecture And Instruction Set : The CPU, Addressing modes, external addressing, Interrupt handling, Instruction execution, Instruction set – data movement; arithmetic; bit operators; branch, Software development tools like assemblers; simulators; cross-compilers, O/P file formats. Hardware Features : 8051 – Device packaging, Chip technology, Power considerations, Reset, System clock/oscillators, Parallel I/O, Timers, Interrupts, Serial I/O, Control store and External memory devices.

Unit III

COMMUNICATION AND INTERFACING WITH HARDWARE:

Pic Microcontrollers and Instruction Set: PIC-18 architecture, File selection register, Memory organization, Addressing modes, Instruction set, Interrupt handling. PIC-18 – Reset, low power operations, oscillator connections, I/O ports, Timers, Interrupts, ADC. Interfacing an LCD to the 8051, 8051 interfacing to ADC, Sensors, Interfacing a Stepper Motor, 8051 interfacing to the keyboard, Interfacing a DAC to the 8051, 8255 Interfacing with 8031/51, 8051/31 interfacing to external memory

Unit IV

EMBEDDED SOFTWARE:

Programming embedded systems in assembly and C – Meeting real time constraints – Multi-state systems and function sequences. Embedded software development tools – Emulators and debuggers.

Unit V

EMBEDDED SYSTEM DESIGN:

Design Methodologies, Requirement Analysis, Specification, System Analysis and Architecture Design. Design Examples: Telephone PBX- System Architecture, Ink jet printer - Hardware Design and Software Design, Personal Digital Assistants, Set-top Boxes

Text Books:

1. Andrew N Sloss, D. Symes and C. Wright, “ARM system developers guide”, Morgan Kaufman/ Elsevier.
2. Michael J. Pont, “Embedded C”, Pearson Education.

Reference Books:

1. Wayne Wolf, “Computers as Components: Principles of Embedded Computer System Design”, Elsevier, Steve Heath.
2. 8051 Microcontroller and Embedded System, M.A Mazidi, J.C. Mazidi

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Course Title	Code	L	T	P	Credits
Business Intelligence	IT E05	3	1	0	4

UNIT I

IMPORTANT CONCEPTS:

Design and implementation aspect of OLTP, Design and implementation aspect of Warehouse, Comparison of Analytical queries with Transactional Queries, Components of Warehouse Architectures.

UNIT II

DIMENSIONAL MODELING AND DW DESIGN:

Star schema and snow flake schema, Grain of dimensional model, transactions, Recurring Snapshots, Accumulating Snapshots, Dimensions (SCD types, conformed dimensions), Facts (additive, semi-additive, non-additive), Hierarchy in dimensions, parent child relationships, Many-Many Dimensional relationship, Multi Valued Dimensions and Dimension Attributes.

UNIT III

ETL:

Data Quality, Data profiling, Data enrichment, data duplication, ETL Architecture and what is ETL, Extraction concept and Change data capture Transformation concept, lookups, time lag, formats, consistency, Loading concept, Initial and Incremental loading, late arriving facts, What is Staging, Data marts, Cubes, Scheduling and dependency matrix.

UNIT IV

REPORTING:

Metadata Layer, Presentation Layer, Data Layer, Use of different layers and overall Reporting architecture, Basic Report authoring, Various report elements such as Charts, Tables, prompts Data aggregation: Table based, Materialized views, Query rewrite, OLAP, MOLAP, Dashboards, Ad-hoc reports, interactivity in analysis (drill down, drill up), Security: report level, data level (row, column) ,Scheduling.

UNIT V

ANALYTICS:

Analytics concepts and use in Business Intelligence, Exploratory and statistical techniques:- Cluster analysis, Data visualization, Predictive analysis :- Regression, Time series, Data Mining :- Hierarchical clustering, Decision tree Text analytics :- Text mining.

UNIT VI

RECENT TRENDS:

Big data like HIVE, PIG and DW appliances like Netezza, Teradata, Smart Change data capture using log based techniques, Real time BI, Operational BI, Embedded BI, Agile BI, BI on cloud.

Text Books:

1. Ralph Kimball, Margy Ross, "The complete Guide to dimensional modeling" 2nd edition.
3. Ralph Kimball, Joe Caserta, "The data warehouse ETL toolkit: practical techniques for extracting, cleaning, conforming, and delivering data"
4. Jiawei Han, Micheline Kamber, Jian Pei "Data Mining: concepts and techniques", 2nd edition.

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Course	Code	L	T	P	Credits
Geographical Information System	IT E06	3	1	0	4

UNIT I

INTRODUCTION TO GIS:

Introduction to GIS, History of GIS, Early developments in GIS, Applications of GIS.

UNIT II

MAP AND MAP SCALES:

Introduction to Maps, History of Maps, Map Scales, Types of Maps, Map and Globe
Georeferencing and Projection: Understanding Earth, Coordinate System, Map Projection, Transformation, Georeferencing.

UNIT III

SPATIAL DATABASE MANAGEMENT SYSTEMS:

Introduction, Data Storage, Database Structure Models, Database Management system, Entity Relationship Model, Normalization

Data Models and Data Structures: Introduction, GIS Data Model, Vector Data Structure, Raster Data structure, Geodatabase and metadata.

UNIT IV

SPATIAL DATA INPUT AND EDITING:

Primary Data, Secondary Data, Data Editing.

Spatial Analysis: Introduction to spatial analysis, Vector Operations and Analysis, Network Analysis, Raster Data Spatial Analysis.

UNIT V

CARTOGRAPHIC PRINCIPLES AND DESIGN:

Introduction, Map layout, Data presentation, Toposheet Indexing, Distribution Maps.

Interpolation: Introduction to Interpolation, Global Methods of Interpolation, Local Methods of Interpolation.

Web GIS: Introduction to Web GIS, OGC Standards and services.

Text Books:

1. Lo, C.P. and Albert Yeung "Concepts and Techniques of GIS", 2nd Edition, Prentice Hall.
2. Longley, P. A., Goodchild, M. F., Maguire, D. J., and Rhind, D. W., Geographic Information Systems and Science.
3. Software Training:Gorr, W. and Kurland, K. GIS Tutorial: Workbook for ArcView 9.

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Course	Code	L	T	P	Credits
TeleMedicine	IT E07	3	1	0	4

UNIT I

INTRODUCTION:

History of Telemedicine, Block diagram of telemedicine system, Definition of telemedicine, Tele health, Tele care, origins and Development of Telemedicine, Scope, Benefits and limitations of Telemedicine.

UNIT II

COMMUNICATION:

Types of information: Audio, Video, still Images, text and data, Fax. Types of Communication and Network: PSTN, POTS, ATN, ISDN, Internet, Wireless Communications: GSM, satellite and Micro Wave. Different modulation techniques, Types of antennas depending on requirements, Integration and Operational issues: system integration, Store and forward operation, real-time Telemedicine.

UNIT III

SWITCHING TECHNIQUES:

Data Exchanges: Network Configuration, Switching Techniques, H.320 series, T.120, h.324 , Video Conferencing.

UNIT IV

SECURITY:

Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, Phases of Encryption. Protocols: TCP/IP, OSI, Standards to followed DICOM, HL7. Ethical and legal aspects of Telemedicine: Confidentiality and Law, patient rights and consent, access to medical Records, Consent treatment, jurisdictional Issues, Intellectual property rights.

UNIT V

TELEMEDICINE SYSTEM:

Tele radiology: Basic parts of Teleradiology system: Image Acquisition system, Display system, Communication network, Interpretation. Tele Pathology: Multimedia databases, color images of sufficient resolution: Dynamic range, spatial resolution, compression methods, Interactive control of colour, Controlled sampling, security and confidentiality tools. Tele cardiology, Teleoncology, Telesurgery.

Text Books:

1. Olga Ferrer-Roca, M.Sosa Ludicissa, Handbook of Telemedicine, IOS press.
2. A.C.Norris, Essentials of Telemedicine and Telecare, John Wiley & Sons.

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Course	Code	L	T	P	Credits
Multimedia Technologies	IT E08	3	1	0	4

UNIT I

MULTIMEDIA SYSTEM DESIGN:

Multimedia Elements, Multimedia Applications, Multimedia System Architecture, Evolving Technologies for Multimedia Systems, Multimedia Databases

UNIT II

COMPRESSION AND DECOMPRESSION TECHNIQUES:

Types of Compression, Binary Image Compression Schemes, Color, gray scale, still-video image compression, Discrete Cosine Transform, Video Image compression, MPEG Coding methodology, Audio Compression, Data and File format standards- RTF, TIFF, RIFF, MIDI, JPEG, AVI, JPEG, TWAIN Architecture.

UNIT III

MULTIMEDIA INPUT AND OUTPUT TECHNOLOGIES:

Key Technology Issues, Pen Input, Video and Image Display Systems, Print Output Technologies, Image Scanners, Digital Voice and Audio, Video Images and Animation, Full Motion Video.

UNIT IV

STORAGE AND RETRIEVAL TECHNOLOGIES:

Magnetic Media Technology, RAID-Level-0 To 5, Optical Media, WORM optical drives, Hierarchical Storage Management, Cache Management for storage systems.

UNIT V

MULTIMEDIA APPLICATION DESIGN:

Types of Multimedia systems - Virtual Reality Design - Components of Multimedia system - Distributed Application Design Issues – Multimedia Authoring and User Interface - Hypermedia Messaging – Distributed Multimedia Systems

Text Books:

1. Andleigh PK and Thakrar K, “Multimedia Systems”, Addison Wesley Longman.
2. Fred Halsall, “Multimedia Communications”, Addison Wesley.
3. Ralf Steinmetz, Klara Nahrstedt, “Multimedia, computing, communications and applications”, Prentice Hall.
4. Tay Vaughan, “Multimedia making It work”, TMH.
5. Weixel, Fulton, Barksdale.Morse, “Multimedia Basics”, Easwar Press.

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Course	Code	L	T	P	Credits
Computer Vision	IT E09	3	1	0	4

Unit I

INTRODUCTION:

Human & Computer vision, Introduction to computer vision & Image processing, Image Formation Models: Monocular imaging system, Transformation: Orthogonal, Euclidean, Affine, Projective, Camera model and Camera calibration, Binocular imaging systems.

Unit II

IMAGE PROCESSING AND FEATURE EXTRACTION:

Image representations (continuous and discrete) & Modeling, Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Labeling.

Unit III

MOTION ESTIMATION:

Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.

Unit IV

SHAPE REPRESENTATION AND SEGMENTATION:

Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multi-resolution analysis

Unit V

OBJECT RECOGNITION:

Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal Component analysis, Shape priors for recognition

Text Books:

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall
2. Robot Vision, by B. K. P. Horn, McGraw-Hill.
3. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri.

References:

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990

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Course	Code	L	T	P	Credits
Medical Informatics	IT E10	3	1	0	4

UNIT 1

COMPUTERS IN MEDICAL RESEARCH:

Medical Informatics and its levels, Need, Design and Development of Standards (HL7 V3); Integrated design concepts, Internet and its applications.

UNIT II

MULTIMEDIA AND VIRTUAL REALITY APPLIED TO MEDICINE:

Basic concepts of Multimedia; Design of Multimedia information systems; Components of virtual reality; Virtual reality applications in medicine, Computer assisted surgery, Surgical simulation.

UNIT III

CLINICAL LABORATORY MEDICAL IMAGING

Intelligent Laboratory Information System - Computerized ECG, EEG and EMG, Computer assisted medical imaging- nuclear medicine, ultrasound imaging ultrasonography-computed X-ray tomography, Radiation therapy and planning

UNIT IV

MEDICAL DATABASE IMPLEMENTATION:

Medical data acquisition and database systems: PC based multichannel data acquisition system; storage, analysis and retrieval techniques.

UNIT V

VISUAL BASIC:

Visual programming concepts; visual Basic environment, tools and controls; Dynamic data exchange; Developing Medical Applications; VB based Medical information System.

UNIT VI

COMPUTERS IN SYSTEM DESIGN:

Hospital Information System its design and functional characteristics; Principles and application of Artificial Intelligence, Pattern Recognition, Neural Network and Fuzzy Logic in Medicine.

UNIT VII

APPLICATION IN MEDICAL FIELD:

QoS provisioning in sensor enabled telemedicine network , Computer in the care of critical patients , ECG diagnostics using DSS.

Text Books:

1. Medical Informatics: Concepts, Methodologies ,Tools, and Applications by Joseph Tan.
- 2 . Medical Informatics: Computer Applications in Health Care and Biomedicine by Edward.

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Course	Code	L	T	P	Credits
Adhoc & Wireless Sensor Networks	IT E11	3	1	0	4

UNIT I

INTRODUCTION AND ARCHITECTURE:

Introduction to Adhoc and Wireless sensor networks – definition, characteristics, applications, challenges. Characteristics of wireless channel, Enabling Technologies for Wireless Sensor Networks. Difference between WSN and IOT.

Single node architecture – Hardware Components, Energy Consumption of sensor nodes.

UNIT II

PHYSICAL LAYER & MEDIUM ACCESS PROTOCOLS:

WSN-Protocol Stack. Physical Layer and Transceiver Design Considerations, Technologies

MAC protocols for WSN: challenges, goals and classification. Contention, Reservation and hybrid protocols

Network Architecture Optimization goals, Gateway, Sink concepts in sensor networks.

IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT III

NETWORK AND TRANSPORT LAYER PROTOCOLS:

Routing Protocols: Design issues, goals and classification- Proactive Vs Reactive routing, Data Centric, Flat Based, Hierarchical, Geographical and QoS Based Routing Algorithms,

Transport Layer: Issues in designing, Adhoc transport layer protocols.

UNIT IV

INFRASTRUCTURE ESTABLISHMENT AND SECURITY:

Time synchronization, Localization, Power Management, Topology Management Techniques, Clustering,

Security issues in Adhoc networks, sensor networks, network security attacks and challenges, secure routing protocols.

UNIT V

SENSOR NETWORK PLATFORMS AND TOOLS:

Sensor Node hardware –Classification, Berkeley motes,

Operating Systems and Execution Environments, Programming challenges, Node level software platforms, Dynamic Reprogramming, Simulators,

Text Books:

1. Ian F. Akyildiz and Mehmeet Can Vuran, “Wireless Sensor Networks” Willey.
2. W.Dargie & C Poellabauer,”Fundamentals of Wireless Sensor Networks”
3. Holger Karl & Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Willey.
4. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks – An Information Processing Approach”, Elsevier.
5. Charles E. Perkins, Ad hoc Networking, Addison – Wesley.

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Course	Code	L	T	P	Credits
Biometrics and Network Security	IT E12	3	1	0	4

UNIT I

BIOMETRICS:

Introduction- benefits of biometrics over traditional authentication systems -benefits of biometrics in identification systems-selecting a biometric for a system –Applications - Key biometric terms and processes verification, identification and biometric matching– Performance measures in biometric systems: FAR, FRR, FTE rate, EER and ATV rate.- biometric matching methods -Accuracy in biometric systems.

UNIT II

PHYSIOLOGICAL BIOMETRIC TECHNOLOGIES:

Fingerprints - Technical description –characteristics Competing technologies - strengths – weaknesses – deployment - Facial scan - Technical description - characteristics - weaknesses- deployment - Iris scan - Technical description – characteristics - strengths – weaknesses – deployment - Retina vascular pattern - Technical description – characteristics - strengths – weaknesses –deployment - Hand scan - Technical description-characteristics - strengths – weaknesses deployment – DNA biometrics.

UNIT III

BEHAVIORAL BIOMETRIC TECHNOLOGIES:

Handprint Biometrics - DNA Biometrics - signature and handwriting technology - Technical description – classification - keyboard / keystroke dynamics - Voice – data acquisition - feature extraction - characteristics - strengths – weaknesses deployment.

UNIT IV

MULTI BIOMETRICS:

Multi biometrics and multi factor biometrics - two-factor authentication with Passwords - tickets and tokens – executive decision - implementation plan.

UNIT V

BIOMETRIC APPLICATIONS:

Categorizing biometric applications – application areas: criminal and citizen identification, surveillance, PC/network access, e-commerce and retail/ATM – costs to deploy – other issues in deployment

UNIT VI

PRIVACY AND STANDARDS IN BIOMETRICS:

Assessing the Privacy Risks of Biometrics – Designing Privacy-Sympathetic Biometric Systems – Need for standards – different biometric standards.

Case studies: Physiological, Behavioral and multifactor biometrics in identification systems.

Text Books:

1. SamirNanavathi, Michel Thieme, and Raj Nanavathi, “Biometrics -Identity verification in a network”, Wiley Eastern.
2. JohnChirillo and Scott Blaul,” Implementing Biometric Security”, Wiley Eastern Publications.

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Course	Code	L	T	P	Credits
Robotics	ITE13	3	1	0	4

UNIT I

INTRODUCTION:

Robot anatomy-Definition, law of robotics, History and Terminology of Robotics- Accuracy and repeatability of Robotics-Simple problems Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems- Robot Drive systems Hydraulic, Pneumatic and Electric system.

UNIT II

MICROCONTROLLER IN ROBOTS:

Support components- Memory and device programming-Interrupts- Built in peripherals- interfacing the controller to robots

UNIT III

SOFTWARE DEVELOPMENT:

Source files, object files, libraries, linkers and hex files-Assemblers- Interpreters- Compilers- Simulators and Emulators- integrated Development environments.

UNIT IV

THE MICROCHIP PIC MICRO(R) MICROCONTROLLER:

Different PIC micro MCU devices and features- Application development tools- Basic circuit requirements- The PIC16f627- EL cheapo PIC micro programmer circuit.

UNIT IV

THE MICROCONTROLLER CONNECTIONS:

Hardware interface sequencing- Robot c programming template- Pro typing with the PIC micro microcontroller- Intercomputer communications-RS232- Hyper Terminal RS232 terminal emulator- RS232 interface example between PC and PIC micro MCU- Bidirectional synchronous interfaces- Output devices- LEDS-PWM power level control- Sensors- Whiskers for physical object detection- Ir collision detection sensors- IR remote controllers- Ultrasonic distance measurement- Light level Sensors- Sound Sensors

UNIT V

BRINGING ROBOTS TO LIFE:

Real time operating system(RTOS)- example application running in an RTOS- State machines- randomly moving a robot application with IR remote control- Behavioural programming – Neural Networks and Artificial Intelligence

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Text Books:

1. Ghosal, A., Robotics: Fundamental Concepts and Analysis, Oxford University Press, 2nd reprint.
2. Fu, K., Gonzalez, R. and Lee, C.S. G., Robotics: Control, Sensing, Vision and Intelligence, McGraw-Hill.
3. S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education.

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Course	Code	L	T	P	Credits
Natural Language Processing	IT E15	3	1	0	4

UNIT I

Introduction: Knowledge in speech and language processing, Ambiguity, Models and Algorithms, Brief History

Regular Expressions and Automata: Regular Expressions, Finite-State Automata, Regular Languages and FSA

Morphology and Transducers: Inflectional and derivational morphology, finite state morphological parsing, Combining FST Lexicon and rules. Lexicon free FST: Porter Stemmer

N-grams: Counting Words in Corpora, SIMPLE (UNSMOOTHED) N-GRAMS, Smoothing, Entropy

HMM and Speech Recognition: Speech Recognition Architecture, Overview of HMM, A* decoding

UNIT II

Word Classes and Part-of-Speech Tagging: English word classes, Targets for English, Part of speech Tagging, Rule Based part of speech Tagging, Transformation Based Tagging.

Context Free Grammars for English: Constituency, Context Free rules and Trees, Sentence level construction, The Noun Phrase, Coordination, Agreement, The verb phrase and sub-categorization. Spoken Language Syntax, Grammar Equivalence and Normal form, Finite state context free grammars, Grammar and human processing.

Parsing with context free grammars: Parsing as Search, Basic Top down Parser, Problems with basic top-down-parsers, the early Algorithm, Finite state parsing method

Features and Unifications: Feature structures, Unification of Features Structures, Features Structures in the grammar, Implementing Unification.

Lexicalized and probabilistic parsing: Probabilistic context free grammars, problems with probabilistic context free grammars, probabilistic lexicalized GFG

UNIT III

Semantics Representing Meaning: Computational Desiderata for representation, Meaning structure of language, First order predicate calculus, linguistically relevant concept, Related Re-presentational approaches, Alternative approaches to meaning.

Semantic Analysis: Syntax driven semantic analysis, Attachment of Fragment of English, Integrating semantic analysis with early parser. Robust Semantic Analysis.

Lexical Semantics: Relation among lexemes and their senses, Internal Structure of words.

UNIT IV

Pragmatics Discourse: Reference resolution, Text Coherence, Discourse Structure, Psycholinguistics Studies of reference and coherence.

Natural Language generation: Introduction to language generation, Architecture for generation, Surface realization, Discourse planning, Macro planning, Lexical selection, evaluating generation systems, generating speech

Features in Multinomial Logistic Regression, Classification in Multinomial Logistic Regression, Learning Logistic Regression, Regularization, Feature Selection, Choosing a classifier and features.

Feed-Forward Neural Networks, Training Neural Nets, Neural Language Models

Books Recommended:

1. *“Speech and Language Processing”* by Daniel Jurafsky and James H. Martin.
2. *“Natural Language Processing with Python”* by Steven Bird

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Course	Code	L	T	P	Credits
Expert Systems	IT E16	3	1	0	4

UNIT I

INTRODUCTION TO EXPERT SYSTEM:

What are Expert Systems, Features of Expert System, features of good Expert System, Role of human in Expert System, Expert System organization, Difference between expert system and conventional program, Basic activities of expert system and the areas in which they solve problems, Prospector systems-features, working.

INFERENCE: Rule based expert systems- Forward chaining, backward chaining - Development Process - Languages and Tools - Explanation facilities - knowledge acquisition.

UNIT II

KNOWLEDGE REPRESENTATION & EXPERT SYSTEM TOOLS:

Knowledge representation in expert systems-using rules semantic nets, frames, Types of tools available for expert system building and how they are used, Stages in the development of expert system tools, Shells and Case Studies, Expert System Shells, Knowledge System Building Tools for Expert System, Expert System tools case study – DENDRIL-MYCIN – EMYCIN –ELIZA, Knowledge Management (Wiki Web case study) Examples of knowledge engineering.

UNIT III

EXPERT SYSTEM ARCHITECTURES

Introduction, Rule Based System Architecture, Non-Production System, Architecture, Dealing with uncertainty, Knowledge Acquisition and Validation, Learning and expert system, , Forms of learning, Rote learning, learning by taking advice, Learning in problem solving, Induction learning, Explanation based learning, Formal learning theory. Connectionist models- learning in Neural network, Architecture of expert system, expert system shell, explanation, knowledge, Acquisition, case studies of an expert system.

UNIT IV

BUILDING AN EXPERT SYSTEMS:

Necessary requirements for expert systems development, Justification for expert system development, Task in building expert systems, Stages of expert system development, Choosing a tool for building expert system, Acquiring knowledge from the experts, Examples of the expert system- building process, Examples of expert system used in different areas. Difficulties in developing an expert system. Common pitfalls in-planning an expert system, Scaling with the domain expert during development process.

UNIT V

NEURAL NETWORK:

Introduction: Biological neural networks-neuron physiology, eyes neural network, Artificial neuron models, Neural net architecture (Topologies), Learning in ANN, Characteristics of ANN

Supervised Learning: Single layer networks-perceptrons, Linear separability, Perceptron training algorithm, Modifications multi-layer network-multi-layer discrimination, back propagation algorithm, Classification using back propagation algorithm, Application of back propagation algorithm, Adaptive multiplier networks-algorithm, boosting, prediction network, radial basis functions .

Unsupervised Learning: Winner-take all networks, Learning vector quantiser, Co-inter propagation networks, Adaptive response theory .

Associative Networks: Non-interactive procedures for association, Hopfield networks, Optimization using Hopfield networks, Brain state in a box network, Boltzmann machines, Hetero associators

Text Books:

1. Stamatios V. Kartalopolous, Understanding Neural Network and Fuzzy Logic, PHI Pvt Ltd.
2. Kishan Mehrotra, Elements of ANN, 2nd Editon, Penram International Publishing Pvt. Ltd.

Reference Books:

1. Donald A. Waterman, A Guide to Expert Systems, Addison-Wesley Publishing Company.

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Course	Code	L	T	P	Credits
Network Management	IT E17	3	1	0	4

UNIT I -- INTRODUCTION TO NETWORK MANAGEMENT:

Analogy of Telephone Network Management, Data and Telecommunication Network Distributed computing Environments, TCP/IP- Based Networks: The Internet and Intranets, Communications Protocols and Standards- Communication Architectures, Protocol Layers and Services; Case Histories of Networking and Management – The Importance of topology , Filtering Does Not Reduce Load on Node, Some Common Network Problems; Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions- Goal of Network Management, Network Provisioning, Network Operations and the NOC, Network Installation and Maintenance; Network and System Management, Network Management System platform, Current Status and Future of Network Management.

UNIT II -- BASIC FOUNDATIONS: STANDARDS, MODELS, AND LANGUAGE:

Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1- Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure; Macros, Functional Model.

UNIT III – SNMP AND ICMP:

Managed Network: The History of SNMP Management, Internet Organizations and standards, Internet Documents, The SNMP Model, The Organization Model, and System Overview.

The Information Model –Introduction, The Structure of Management Information, Managed Objects, Management Information Base. The SNMP Communication Model – The SNMP Architecture, Administrative Model, SNMP Specifications, SNMP Operations, SNMP MIB Group, Functional Model. ICMP

UNIT IV -- SNMP MANAGEMENT – RMON:

Remote Monitoring, RMON SMI and MIB,RMONI1- RMON1 Textual Conventions, RMON1 Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring Extension Groups, RMON2 – The RMON2 Management Information Base, RMON2 Conformance Specifications; ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON

UNIT V -- NETWORK MANAGEMENT APPLICATIONS:

Configuration Management- Network Provisioning, Inventory Management, Network Topology, Fault Management- Fault Detection, Fault Location and Isolation Techniques, Performance Management – Performance Metrics, Data Monitoring, Problem Isolation, Performance Statistics; Event Correlation Techniques – Rule-Based Reasoning, Model-Based Reasoning, Case-Based Reasoning, Codebook correlation Model, State Transition Graph Model, Finite State Machine Model, Security Management – Policies and Procedures, Security Breaches and the Resources Needed to Prevent Them, Firewalls, Cryptography, Authentication and Authorization, Client/Server Authentication Systems, Messages Transfer Security, Protection of Networks from Virus Attacks, Accounting Management, Report Management.

Books Recommended:

1. “*Network Management: Principles and Practice*” by Mani Subramanian.
2. “*Open Source Network Administration*” by James M. Kretchmar.

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Course	Code	L	T	P	Credits
Software Project Management	IT E18	3	1	0	4

UNIT I

INTRODUCTION AND SOFTWARE PROJECT PLANNING:

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT II

PROJECT ORGANIZATION AND SCHEDULING:

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT III

PROJECT MONITORING AND CONTROL:

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators:

Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Desk-checks, Walkthroughs, Code Reviews, Pair Programming.

UNIT IV

SOFTWARE QUALITY ASSURANCE AND TESTING

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model (CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Clean-room process.

UNIT V

PROJECT MANAGEMENT AND PROJECT MANAGEMENT TOOLS

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, Rational team concern.

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Text Books:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education.
3. Kieron Conway, Software Project Management, Dreamtech Press.
4. S. A. Kelkar, Software Project Management, PHI Publication.

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Course	Code	L	T	P	Credits
Distributed Computing	IT E19	3	1	0	4

UNIT I

INTRODUCTION:

Definition of a distributed system, goals, connecting users and resources, transparency, openness, scalability, hardware concepts, software concepts, distributed operating systems, network operating systems, middleware, and the client-server model. Limitation of distributed system.

UNIT II

CHARACTERIZATION OF DISTRIBUTED SYSTEMS:

Introduction, examples of distributed systems, resource sharing and the web challenges. Architectural models, fundamental models.

Communication: layered protocols, remote procedure call, remote object invocation, message-oriented, stream-oriented communication, processes, threads, clients, servers, code migration, weak and strong migration, software agents.

UNIT III

SYNCHRONIZATION:

Clock synchronization, physical clocks, clock synchronization algorithms, logical clocks, lamport timestamps, vector timestamps, global state, election algorithms, the bully algorithm, ring based algorithm, mutual exclusion, a centralized algorithm, a distributed algorithm, a token ring algorithm, a comparison of the three algorithms.

Distributed file systems: Sun network file system, overview of NFS, communication, processes, naming, synchronization, caching and replication, fault tolerance, security, the coda file system, other distributed file systems, comparison of distributed file systems, philosophy, communication, processes, naming, synchronization, caching and replication, fault tolerance, security.

UNIT IV

REPLICATION:

System model and group communication, fault - tolerant services, highly available services, transactions with replicated data.

Fault tolerance: Introduction to fault tolerance, basic concepts, failure models, failure masking by redundancy, process resilience, design issues, failure masking and replication, agreement in faulty systems, reliable client-server communication, point-to-point communication, RPC semantics in the presence of failures, reliable group communication, basic reliable-multicasting schemes, scalability in reliable multicasting, atomic multicast, distributed commit, recovery, checkpointing, message logging.

UNIT V

SECURITY:

Introduction to security, security threats, policies, and mechanisms, design issues, cryptography, secure channels, authentication, message integrity and confidentiality, secure

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group communication, access control, general issues in access control, firewalls, secure mobile code, security management, key management, secure group management, authorization management, kerberos, sesame, electronic payment systems.

Text Books:

1. Coulouris, dollimore, kindberg, "distributed system: concepts and design", Pearson Education.
2. Andrew S. Tanenbaum, Maarten van Steen, "Distributed Systems: Principles and Paradigms", 2nd edition, Prentice Hall India.
3. Gerald tel, "Introduction to Distributed Algorithms"2nd edition, Cambridge University Press

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Course	Code	L	T	P	Credits
Theory of Computation	IT E20	3	1	0	4

UNIT I

INTRODUCTION:

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

UNIT II

AUTOMATA & LANGUAGES:

Finite Automata, Deterministic and non-deterministic automata, regular operations, regular expressions, regular and non-regular languages.

UNIT III

CONTEXT FREE LANGUAGES:

Types of grammars, Context free grammars, pushdown automata, context free languages, closure properties, concepts in parsing, Computability theory

UNIT IV

COMPUTABILITY THEORY:

Turing machines, variants of Turing machines, the definition of algorithm Decidability, reducibility, enumerability, Church Turing thesis, Rice's theorem.

UNIT V

COMPLEXITY THEORY:

Time complexity, space complexity, Complexity class P and NP, NP complete problems.

Books Recommended

1. *“Elements of the Theory of Computation”* by H. R. Lewis and C. H. Papadimitrou
2. *“Introduction to Automata Theory, Languages and Computation”* by J. Hopcroft and J. Ullman.
3. *“Introduction to the Theory of Computation”* by Micheal Sipser.

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Course	Code	L	T	P	Credits
Advanced Internet Technologies	IT E21	3	0	2	4

UNIT I

ADVANCED INTERNET PROTOCOLS:

DNS, DHCP, FTP, Working and configuration of DNS, DHCP and FTP

UNIT II

IPV6 AND ROUTING:

Understanding IPv6, CIDR, Hierarchical Routing, and Routing Protocol over internet. Multimedia over Internet, Voice over IP, Virtual Private network Internet as a Distributed computing platform

UNIT III

WEB SERVICES AND CLOUD COMPUTING:

Understanding Web Services technology, REST based web services (Resource Oriented Architecture) and Service oriented Architecture. Introduction to cloud computing, Working of Peer to Peer over internet

UNIT IV

ADVANCED INTERNET PROGRAMMING:

HTML 5.0, Rich Internet Technology, AJAX, FLEX , Integrating PHP and AJAX, Consuming Web Service with AJAX, Resource Syndication (RSS), Working principle of search engines

UNIT V

INTERNET SECURITY:

Public Key Infrastructure, Client side Vulnerabilities, Server Side Vulnerabilities, Database Vulnerabilities, Secure Payment Mechanism, Security issues in cloud.

Books Recommended:

1. “Advanced Internet Technology” by Deven Shah.
2. “Advanced Internet Technologies” by Uyles Black.

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Course	Code	L	T	P	Credits
Linux Administration	IT E22	3	0	2	4

UNIT I

INTRODUCTION:

Introduction to UNIX, Linux, GNU and Linux distributions. The Linux System Administrator, duties the System Administrator, Installing and Configuring Servers, Installing and Configuring Application Software, Creating and Maintaining User Accounts, Backing Up and Restoring Files, Monitoring and Tuning Performance, Configuring a Secure System, Using Tools to Monitor Security.

UNIT II

LINUX BASICS:

Command line: Introduction to Bash Shell, Basic Commands such as ls, cd, tail, cat, mkdir , Commands to work with file , mv, cp, rm, touch, echo, search commands like find, locate, and which. Text editor vim, nano, gedit, kwrite , pipes, stream redirection, Stream text editor grep, sed, and awk, Compression using Tar, gzip and bzip2 and Easily accessible tools in Linux.

System Initialization: Boot Sequence Overview , Boot loaders-GRUB, LILO, Bootstrapping, GRUB and grub.conf , the Boot Process, Run Levels, /etc/rc.d/rc.sysinit, /etc/rc.d/rc, /etc/rc.d/rc.local, Configuring services to run at boot , init.d, chkconfig, Securing single user mode (su login) , Shutting down and rebooting the system.

UNIT III

PACKAGE MANAGEMENT:

Working with packages, RPM Packages ,eManager , Installing and Removing Software, Updating a Kernel RPM , rpm Queries , rpm Verification , Using yum ,Searching packages/files , Configuring and Creating Additional Repositories, installing form source code.

UNIT IV

KERNEL MANAGEMENT:

The Linux Kernel , Configuring the kernel, Kernel Images and Variants , Kernel Modules , Kernel Module Utilities , Managing the initrd Image, Accessing Drivers Through /dev , udev , Adding Files Under /dev , Kernel Configuration With /proc , sysctl : Persistent Kernel Configuration , Exploring Hardware Devices (hwinfo), compiling and installing custom kernels.

UNIT V

PROCESSESMANAGEMENT:

Process status , process priority, Starting up and Shut down, Killing processes, sending signals to process (kill, killall, xkill) Monitoring Processes and Resources (ps, pstree, top).

User Management: users and groups, creating new user account, User Private Groups, Modifying / Deleting User Accounts, Group Administration, Password Aging Policies,

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Switching Accounts, sudo, Network Users, Authentication Configuring NIS, LDAP, SUID and SGID Executables , SGID Directories, The Sticky Bit, Default File Permissions, Access Control Lists (ACLs), SELinux, Targeted Policy, Management

File system Management: Understanding files in linux, file types, links, File system, File system Tree, Disk Partitioning mount tool , Mount Points and /etc/fstab, Mounting and unmounting Filesystems, Swap Files and Partitions, Mounting NFS Filesystems, Automounter, disk utilities such as df, du, fsck, File system security, Users and groups, The superuser, chown , chgrp, chmod. backup and restoring file system.

UNIT VI

NETWORK MANAGEMENT:

Configuring the TCP/IP Networking, DHCP, dhcpd.conf , dhcpd.leases, Local Resolver, Remote Resolvers, important configuration files. The Network File System, Configuring an NFS Server, Configuring an NFS Client, Using Automount Services, Examining NFS Security. Domain Name System, working, DNS, Types, Configuration Files, Configuring a Caching DNS Server, Configuring a Primary and Secondary Master DNS Servers, Configuring FTP Services, vsftpd, SFTP.

Text Books:

1. Evi Nemeth et al. "UNIX and Linux System Administration Handbook" , 4th Edition, Prantice Hall.
2. Aleen Frisch , "Essential System Administration: Tools and Techniques for Linux and Unix Administration".
3. James Turnbull et al. "Pro Linux System Administration", 1st Edition, Apress.

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Course	Code	L	T	P	Credits
Open Source & Software Development	IT E23	3	0	2	4

UNIT I

HISTORY AND EMERGENCE OF OPEN SOURCE SOFTWARE:

The Open Source Definition, , The philosophy of OSS, Richard Stallman, The Cathedral and the Bazaar (CatB), Open Source Initiative (OSI). FSF, 3 C's of Open source, Open source development models, Application Programming Interface (API). GNU Project, Free Software Foundation. Communities in Open Source Movement.

UNIT II

OPEN STANDARDS:

Definition, Purpose, Open Standards Requirement for software, Compliance, Open Standards Requirement Rationale, Latex

Open Source Licenses: Definition, licenses and copyrights, ISO , The License Review Process, ISO approved Popular Licenses, GNU General Public License (GPL), GNU Lesser General Public License (LGPL), GNU Affero General Public License (AGPL), Apache License 2.0, BSD Licenses, Common Development and Distribution License etc.

UNIT III

BUSINESS MODEL:

Challenges, Approaches, Dual-licensing, Selling professional services, Selling of branded merchandise, Selling software as a service, Partnership with funding organizations, Voluntary donations, Bounties, Pre-order/crowd funding/reverse-bounty model, Advertising-supported software, Selling of optional proprietary extensions, Selling of required proprietary parts of a software product, Re-licensing under a proprietary license, Obfuscation of source code, Delayed open-sourcing, FOSS and economy.

UNIT IV

DEVELOPMENT MODEL:

Types of open-source projects, standalone software programs and libraries, Distributions, Other open-source projects, book or standalone document project, development models, rapid prototyping, incremental and evolutionary development, spiral lifecycle, rapid application development, and, recently, extreme programming, the agile software process, and internet speed development. Tools, Communication channels, Version control systems, Bug trackers and task lists, Testing and debugging tools, Package management, Refactoring, rewrites and other revamps, Publicizing a project.

Text Books:

1. Raymond, E.S. The Cathedral & the Bazaar. O'Reilly.
2. Sharma, S., Sugumaran, V. & Rajagopalan, B. A framework for creating hybrid-open source software communities. Information Systems Journal

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Course Title	Code	L	T	P	Credits
Pervasive Computing	IT E25	3	0	0	3

UNIT I

INTRODUCTION:

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

UNIT II

PROTOCOLS:

Open protocols- Service discovery technologies- SDP, Jini, SLP, UpnP protocols–data synchronization- SyncML framework - Context aware mobile services - Context aware sensor networks, addressing and communications- Context aware security.

UNIT III

TECHNOLOGIES:

Past, Present and Future-Device Technology-Device Connectivity-Web application Concepts- WAP and Beyond-Voice Technologies-Personal Digital Assistants.

UNIT IV

ARCHITECTURE:

Server side programming in Java-Pervasive Web application Architecture-Example Application- Access via PCs-Access via WAP-Access via PDA and Voice.

UNIT V

REAL TIME APPLICATIONS OF PERVASIVE COMPUTATION:

Smart Tokens, Heating Ventilation and Air Conditioning, Set Top Boxes, Appliances and Home Networking, Residential Gateway, Automotive Computing, On Board Computing Systems, In Vehicle networks, Entertainment Systems.

Text Books:

1. Seng Loke, Context-Aware Computing Pervasive Systems, Auerbach Pub.
2. Uwe Hansmann etl , Pervasive Computing, Springer, New York,2001.

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Course	Code	L	T	P	Credits
System Analysis & Design	IT E29	3	1	0	4

UNIT I

INTRODUCTION:

Overview of system analysis and design, Business system concepts, system development life cycle, project selection, feasibility analysis, design implementation testing and evaluation.

UNIT II

FEASIBILITY STUDIES:

Technical and economic feasibility, cost and benefit analysis, system requirement specification and analysis, fact finding techniques. Draw flow diagrams, data dictionaries, process organization and interaction, decision trees and table: structural English advanced modeling methods, ER Diagram & DFDS, Entity relationship model.

UNIT III

PROJECT SELECTION:

Source of project requests, managing project review and selection, preliminary investigation.

UNIT IV

DETAILED DESIGN:

Modularization, module specification, files design, system development involving database, program design, practical design, System control and quality assurance, system administration and training, conversion and operation plans hardware and software selection.

Text Books:

1. Raja Raman. V.”system analysis and design “prentice-hall
2. Murdic, r.g. rose, j.e. &claggt, J.R. “information systems for modern management “Prentice-Hall India.
3. Wigardes. K. Svenson, A. Sehong, L.A. & Dahlgren, G., “Structured Analysis and Design of information System:, McGraw Hill Book Company

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Course	Code	L	T	P	Credits
Data Mining	IT E30	3	1	0	4

UNIT I

DATA WAREHOUSING:

Data warehousing-characteristics and components of a data warehouse, ETL process, Data marts, Data warehouse logical design: star schemas, snowflake, fact tables, dimensions, other schemas, Materialized views, Data warehouse physical design: hardware and I/O considerations, Parallelism, indexes.

UNIT II

DATA MINING:

Data mining approaches and methods: Objectives of Data Mining the Technical context for Data Mining ,Data pre-processing, concept description, Research trends in data warehousing and data mining, Machine learning, Decision support and computer technology.

UNIT III

DATA MINING KNOWLEDGE REPRESENTATION:

Task relevant data, Background knowledge, Interestingness measures, Representing input data and output knowledge, Visualization techniques.

UNIT IV

DATA MINING TECHNIQUES AND ALGORITHMS:

Process of data mining, Data Mining Techniques: Classification & Predication, Decision trees, Neural Networks, Bayesian Classification, Association rules, Apriori, FP Tree, Mining complex types of data, Correlation analysis.

UNIT V

CLUSTER ANALYSIS:

Basic issues in clustering, Types of data in cluster Analysis, First conceptual clustering system: Cluster/2, Partitioning methods: k-means, expectation maximization (EM) ,Density-Based Methods, Hierarchical methods: distance-based agglomerative and divisible clustering ,Neural Network Approach: Outlier Analysis.

UNIT VI

APPLICATIONS AND TRENDS IN DATA MINING:

Text mining: extracting attributes (keywords), structural approaches (parsing, soft parsing), Bayesian approach to classifying text, Web mining: classifying web pages, extracting knowledge from the web, Data Mining software and applications.

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Text Books:

1. Jiawei Han and Micheline Kamber: Data Mining – Concepts and Techniques, 2nd Edition, Morgan Kaufmann.
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education.

Reference Books:

1. K.P.Soman, ShyamDiwakar, V.Ajay: Insight into Data Mining – Theory and Practice, PHI.

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Course	Code	L	T	P	Credits
Real Time Operating Systems	IT E26	3	0	0	3

UNIT-I: Introduction to OS and RTOS

Operating system objectives, architecture and functions, Evolution of operating systems, Batch, multi programming. Multitasking, Multiuser, parallel, distributed & real –time O.S.

UNIT-II: Process Management of OS/RTOS

Process, thread, lifecycle of a process, Context Switching Basic Scheduling algorithms in O.S. Real Time Task Scheduling: Process state and scheduling, Clock driven and Event driven scheduling, Rate-Monotonic Scheduling, Earliest-Deadline First Scheduling, Fault-Tolerant Scheduling

UNIX Multi-level feedback queue scheduling, Thread Scheduling, Multiprocessor Scheduling concept, Real Time Scheduling concepts.

UNIT-III: Process Synchronization

Principles of Concurrency, Mutual Exclusion, Semaphores and Mutex, Message Passing, Monitors, Some Classical Problems of Synchronization, Handling resource sharing and dependencies among real time tasks: Resource sharing Protocols: Priority Inheritance Protocol, Highest locker protocol, priority ceiling protocol, Priority Inversion, Issues in resource sharing protocols

Inter-process Communication: Signals, Shared Memory Communication, Message-Based Communication

UNIT-IV: Memory & I/O Management:

Memory Management: Requirements, partitioning. Memory allocation Strategies, Fragmentation, Swapping, Segmentation, Paging, Virtual Memory, Demand paging, Page Replacement Policies

Real-time Memory Management: Process Stack Management, Dynamic Allocation

Evaluating and Optimizing Operating System Performance: Effects of scheduling, Response-time Calculation, Interrupt latency, Time-loading, Memory Loading, Power Optimization Strategies for Processes, Advanced Configuration and Power Interface

I/O Operations: Synchronous and Asynchronous I/O, Interrupt Handling, Details on Device Drivers

UNIT-V: RTOS APPLICATION DOMAINS

Comparison and study of RTOS: Vxworks and μ COS – Case studies: RTOS for Image Processing – Embedded RTOS for voice over IP – RTOS for fault Tolerant Applications – RTOS for Control Systems.

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Text Books:

1. Silberschatz, Peter Galvin, Greg Gagne "Operating System Principles".
2. William Stallings, "Operating Systems – internals and design principles", Prentice Hall.

Reference Books:

1. Andrew S. Tannenbaum & Albert S. Woodhull, "Operating System Design and Implementation", Prentice Hall.
2. Andrew S. Tannenbaum, "Modern Operating Systems", Prentice Hall.
3. Gary J. Nutt, "Operating Systems", Pearson/Addison Wesley.
4. Pramod Chandra P. Bhatt, "An Introduction to Operating Systems Concepts and Practice".

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Course	Code	L	T	P	Credits
Internet of Things	IT E27	4	0	0	6

UNIT I

Introduction: Internet, Wireless Sensor Network, Sensor Node Architecture, Examples and Applications, Internet of Things: Definition, Basic Components of IoT, Thing, Sensing & Actuators, Vision, Physical Parameters, Web 3.0

UNIT II

Architecture: Basic Architecture: 3 layer and 5 layer Architecture, ITU-IoT Reference Model, Machine to Machine Communication, IoT Gateways

UNIT III

Technologies: IPv4, IPv6, Identification Technology: RFID System, Types, Components and applications. Bluetooth Low Energy (BLE), ZigBee: Architecture, Comparison with other wireless standards. Electronic Product Code (EPC), Near Field Comm. (NFC), 6LoWPAN, End to End Reliability: COAP, MQTT, SCADA, XML.

UNIT IV

Hardware and Software Platforms:

Hardware: Raspberry Pi, Arduino, Intel Galileo

Software: TinyOS, Contiki OS, RTOS, WebOS

UNIT V

Internet of Things Privacy and Security: Introduction, Privacy and Security Issues, Steps towards a security platform in IoT.

UNIT VI

Application Areas: Home Automation, Smart Cities, Medical, Logistics, Environment, Analytics. Smart Grids

IoT in relation to Big Data and Cloud Computing, Overview of Fog computing

Text Books:

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands on Approach)”.
2. Hakima Chaouchi (editor) “The Internet of Things Connecting Objects to the Web” by Wiley publications