NOTIFICATION

No. 191/2023 Dated : 23/11/2023

Subject : Implementation of new syllabus of Semester I to IV of the Course M.E. (Information Technology) as per CBCS Pattern from the Session 2023-2024 onwards.

It is notified for general information of all concerned that the authorities of the University have accepted to implement the new syllabus of Semester I to IV of the Course M.E. (Information Technology) as per CBCS Pattern from the Session 2023-2024 onwards as mentioned below:

Sd/-
(Dr.T.R.Deshmukh)
Registrar

SYLLABUS PRESCRIBED FOR TWO YEAR P.G. DEGREE COURSE IN
MASTER OF ENGINEERING IN INFORMATION TECHNOLOGY
(FULL TIME SEMESTER PATTERN)
(AS PER CHOICE BASED CREDIT SYSTEM)

SEMESTER: FIRST

1NMEF1 OPERATING SYSTEM CONFIGURATION

Unit-I: Introduction to OS Internals. Overview of OS and Kernel, Linux and classic UNIX kernels. Kernel Source tree. Process management in Linux: Process descriptor and task structure, process creation, implementation of threads, process termination, process scheduling.

Unit-II: Process Scheduling in Linux: The Linux Scheduling Algorithm, Preemption and Context Switching, Real-Time, Scheduler Related System Calls, System Calls: Handler, Implementation and Context. Interrupts and Interrupt Handlers.

Unit-III: Kernel Synchronization in Linux: Critical Regions and Race Conditions, Locking, Deadlocks, Contention and Scalability. Kernel Synchronization Methods: Spin Locks, Semaphores, Completion Variables. Preemption Disabling.

Unit-IV: Time Management in Linux: Kernel Notion of Time, Hardware Clocks and Timers, The Timer Interrupt Handler, Delaying Execution. Memory Management in Linux: pages, zones, kmalloc, vmalloc, slab layer allocator, statically allocating on the stack, high memory mapping. Per-CPU Allocations.

Unit-V: The Virtual File System in Linux: common file system interface, file abstraction layer, UNIX file system, VFS, dentry object, Super block object, file object, data structure associated with file systems and with a process. The Block I/O Layer and I/O Scheduler in Linux.

Unit-VI: The Process Address Space, the Memory Descriptor, Memory Areas, Page Tables. The Page Cache and Page Write back: Page Cache, Radix Tree, Buffer Cache. Linux Kernel Modules: Building, installing, Loading and managing. Portability in Linux.

Text book : Robert Love, “Linux Kernel Development” Pearson Education, 2/e.

Reference Books:

1. Daniel Bovet, “Understanding the Linux Kernel” O’Reilly Publications 2/e.
2. Rubini and J. Corbet . Linux Device Drivers. O’Reilly and Associates, 2001.
3. D. Mosberger and S. Eranian. IA-64 Linux Kernel: Design & Implementation. Prentice Hall, 2002.
4. M. McKusick and G. Neville-Neil . The Design and Implementation of the FreeBSD Operating System. Addison-Wesley, 2004.

1NMEF2 DATABASE SYSTEM DESIGN

Unit I: Introduction to Database Processing, File Processing Systems, Definition of Database. The Entity-Relationship (E-R) Model: Element of the E-R Model, E-R Diagrams, Examples, Database as Models of Models. The Semantic Object Model: Semantic Objects, Creating Data Models with Semantic Objects, Types of Objects, Comparison of the Semantic Object and the E-R Model.

Unit II: The Relational Model and Normalization: The Relational Model, normalization, First through Fifth Normal Forms, Domain Key Normal Forms, The Synthesis of Relations, Multi-Value Dependencies, Iteration, Optimization.

Unit III: Database Design using Entity-Relationship Models: Transformation of Entity Relationship Models into Relational Database Designs, Example Design. Trees, Networks. Database Design with Semantic Object Models: Transformation of Semantic Objects into Relational Database Design, Sample Objects.

Unit IV: Foundation of Relational Implementation: Defining Relational Data, Relational Data manipulation, Relational Algebra. SQL: Querying a Single Table, Querying Multiple Tables, Exist and Not Exists, Changing Data. Database Application Design: Creating, Reading, Updating and Deleting View Instances, Form Design, Report Design, Enforcing Constraints, Security and Control, Application Logic.

Unit V: Managing Multi-User Databases: Database Administration, Concurrency Control, Database Security, and Database Recovery. Managing Database with Oracle: Creating an Oracle Database, Application Logic, Data Dictionary, Concurrency Control, Oracle Security, Oracle Backup and Recovery.

Unit VI: Networks, Multi-Tier Architecture, and XML: Network Environments, Multi-Tier Architecture, Markup Languages HTML and DHTML, XML-Extensible Markup Language. ODBC, OLE DB, ADO and ASP: The Web Server Data Environment, Open Database Connectivity (ODBC) Standard, JDBC, Java Server Pages, MySQL.

Text Book: David M. Kroenke: Database Processing- Fundamentals, Design and Implementation, 8th Edn. (PHI).

Reference Books:
1. C.J. Date: Database Processing, (Addison Wesley).
2. R. Ramakrishnan: Database Management Systems, (McGraw Hill).
3. Ramez Elmasri and Shamkant B. Navathe: Fundamentals of Database Systems, 2nd Edition.

1NMEF3 NET-CENTRIC COMPUTING

Unit I: Overview of Computer Communications and Networking, Types of Computer Networks, Network Addressing, Routing, Reliability, Interoperability, and Security, Network Standards, Network Applications and Application Protocols, Computer Communications and Networking Models, Communication Service Methods and Data Transmission Modes, Analog and Digital Communications, Speed and Capacity of a Communications Channel, Multiplexing and Switching, Network Architecture and the OSI Reference Model.

Unit II: Physical Layer Concepts, Copper Media, Fiber-Optic Media, Wireless Communications, Satellite Communications, structured cabling Systems, Data Link Layer Concepts, LLC Sublayer, MAC Sublayer, Data Prioritization and Quality of Service.

Unit III: Internetworking Concepts, The Network Layer and Routing Concepts, Routing Protocols, RIP, OSPF, Router and Switches, VPNs, Internet Administration, TCP/IP, TCP/IP Transport and Network Layer Protocols, IP Addresses, IPv6, TCP/IP Application Level Protocol.

Unit IV: Ethernet and 802.3 Networks, 10-MBPS Ethernet/802.3 LANS, Switched Ethernet, Full-Duplex Ethernet, and Virtual LANs, Fast Ethernet, Gigabit Ethernet, Token Ring, Frame Formats, Priority and Reservation, Monitor Stations, Second-Generation token Ring, Token Ring versus Token Bus.

Unit V: Fiber Distributed Data Interface, Physical Layer Specifications, Frame Formats and Medium Access Specifications, Configuration and Design Issues, Integrated services Digital Network, Components, Channel types, BRI, PRI, ISDN Protocols, Frame Relay Circuits, Data link Layer Issues & Information.

Unit VI: Switched Multimegabit Data Services, Technical Overview, SIP, SMDS Addressing, SMDS versus Other LAN-to-LAN Technologies, ATM, Concepts and Operation, ATM interface Standards, ATM Cells, Virtual Connections, And Addressing, AAL, ATM and Convergence Technology, ATM versus Other Technologies and Services, Dialup Networking, DSL Services.

Text Book: Michael A. Gallo, William M. Hancock: Computer Communications and Networking Technologies. Cengage Learning

Reference Books:
1) Stallings W., “High Speed Networks and Internets: Performance and Quality of Service”, Prentice Hall, 2002.
2) Kershenbaum A., “Telecommunications Network Design Algorithms”, Tata McGraw Hill.
3) Douglas E. Comer, “Computer Networks and Internet”, Pearson Edu. Asia.
4) Andrew Tanenbaum, “Computer Network”, PHI.

1NMEF4 PROGRAM ELECTIVE-I (i) SOFTWARE ENGINEERING METHODOLOGIES

Unit I: Software Process Models: Software Process Framework, Process Patterns, Personal and Team Process Models, Process Models: Waterfall Model, Incremental Models, Evolutionary Models, Iterative Development, The Unified Process, Agile process, Process Assessment, CMMI, Impact of Processes and Outcomes, Process Selection and applicability.

Unit II: Requirements Engineering: Requirements Engineering Tasks, Requirement Elicitation Techniques, Software Requirements: Functional, Non-Functional, Domain, Requirements Characteristics and Characterization, Requirement qualities, Requirement Specification, Requirement Traceability, System Analysis Model Generation, Requirement Prioritization.

Unit III: UML Concepts : Programming In Small Versus Programming In Large, UML 2.0 History/ New Features MDA/ MOF/ XMI/ CORBA, Introduction to UML Meta-model, Extensibility Mechanisms and its usage, Introduction to OCL, Specification techniques of diagrams in UML.

Unit IV: Behavioral Model: Use Cases, Use Case Diagram Components, Use Case Diagram, Actor Generalization, Include and Extend, Template for Use Case Narrative, Using Use Cases Data Dictionary : Finding the Objects, Responsibilities, Collaborators, and Attributes, CRC Cards, Dynamic Behavior : Sequence diagrams, object lifelines and message types, Activity Diagrams : Decisions and Merges, Synchronization.

Unit V: Design Engineering: Design quality, Design Concepts, The Design Model, Introduction to Pattern-Based Software Design, Architecture styles: Main program with sub program style, Abstract data type style, Repository, Layered. Architectural Design: Software Architecture, Data Design and Architectural Design.

Unit VI: Object Oriented Design: Design of Objects, Design and Factoring, Design of Software Objects, Features and Methods, Cohesion of Objects, Coupling between Objects, Coupling and Visibility, Inheritance, Establishing The Object Model, Refining classes and associations, Analysis model vs. design model classes, Categorizing classes: entity, boundary and control, Modeling associations and collections, Achieving reusability, Reuse through delegation, Identifying and using service packages.

Reference Books:

1. Ian Sommerville, “Software Engineering”, 7th Edition, AddisonWesley, 2004
2. Grady Booch, James Rambaugh, Ivar Jacobson, “Unified Modeling Language Users Guide”, 2nd Edition, Addison Wesley,.
3. Jim Arlow, Ila Neustadt, “UML 2 and Unified Process: Practical Object Oriented Analysis and Design.“, 2nd Edition, Addison Wesley,
4. Tom Pender, “UML Bible”, John Wiley & Sons,.
5. Stephen H. Kan, “Metrics and Models in Software Quality Engineering”, Pearson Education.

1NMEF4 PROGRAM ELECTIVE-I (ii) INTELLIGENT SYSTEM

Unit I: Artificial Intelligence: Intelligence, Artificial intelligence, intelligent systems. Knowledge representation : Reasoning, issue and acquisition : propositional calculus, predicate calculus, Rulebased knowledge representation, Truth Maintenance system.

Unit II: Expert Systems: introduction, expert systems, stages in the development of expert system, expert system tools, difficulties in developing expert systems, applications of expert systems.

Unit III: Fuzzy Systems: introduction, foundation of fuzzy systems, fuzzy relations, arithmetic operations of fuzzy numbers, linguistic descriptions and their analytical forms, defuzzification methods, fuzzy logic in control and decision-making applications

Unit IV : Artificial Neural Networks : introduction, Neuron physiology, artificial neurons, artificial neural networks, features of artificial neural networks, back propagation training algorithms, functional link neural networks, cascasde correlation neural networks.

Unit V: Genetic Algorithms and Evolutionary Programming : introduction, genetic algorithms, procedures of genetic algorithms, the working of genetic algorithms, evolutionary programming, genetic-algorithm-based machine learning classifier system.

Unit VI: Swarm Intelligent Systems : introduction, importance of the ant colony paradigm, ant colony systems, development of the ant colony systems, application of ant colony intelligence, the working of ant colony systems : Probabilistic Transition rule, Pheromone Updating ,Types of ant colony models, particle Swarm intelligent systems .

Text Book : N.P.Padhy, “Artificial Intelligence and Intelligent Systems”, Oxford.

Reference Book :

1. Hakin, Simon 2003, "Neural Networks: A Comprehensive Foundation", PHI, New Delhi.
2. Kosko B. 1997, "Neural Networks and Fuzzy Systems", PHI, New Delhi.
3. Rajasekaran S. and G.A.Vijayalakshmi Pai, 2003, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, New Delhi.
4. Sriram, Ram D. 1977, "Intelligent Systems for Engineering - A Knowledge-Based Approach", Springer, London.

1NMEF4 PROGRAM ELECTIVE-I (iii) LEGAL AND PROFESSIONAL ETHICS

Unit-I: Technical communication: Oral presentations Technical writing, System documentation, Technical requirements Team Work Culture: Collaboration, Group dynamics, Leadership styles, Personality types, Collaboration tools.

Unit-II: Social informatics, Social impact of IT on society, Online communities & social implications, Philosophical context, 81 82 Diversity issues, Gender-related issues, Cultural issues, Accessibility issues, Globalization issues, Economic issues in computing, Digital divide.

Unit-III: Foundations of intellectual property, Ownership of information, Plagiarism, Software piracy, Fair use, Digital Millennium Copyright Act (DMCA), Copyrights, patents, trademarks and trade secrets, NDAs, International differences.

Unit-IV: Legal Issues: Compliance to Cyber laws, Hackers/crackers, Computer crime, Viruses, System use policies & monitoring, Risks and liabilities of computer-based systems, Accountability, responsibility, liability.

Unit-V: Organizational context: Business processes, IT environment, Organizational culture, Professionalism, Relationships with professional societies., Codes of professional conduct, such as IEEE, ACM, BCS, ITAA, AITP. Ethics and history of ethics, Whistle-blowing, Workplace issues (harassment, discrimination), Identify theft, Ethical hacking,

Unit-VI: Implications of: History of computer hardware, software, History of the Internet History of Telecommunications, The IT profession, IT education. Privacy and civil liberties.

BOOKS RECOMMENDED:

1. Meenakshi Raman, Sangeeta Sharma," Technical Communication – English Skills for Engineers" Oxford Higher Education
2. George Reynolds, "Ethics in Information Technology", Thomson Course Technology, 2003
3. Sara Baase, "A Gift of Fire: Social, Legal and Ethical Issues for Computing and the Internet ", PHI publications
4. Richard A. Spinello, "Case Studies in Information Technology Ethics", Second Edition, PHI

1NMEF5 PROGRAM ELECTIVE-II (i) REAL TIME EMBEDDED SYSTEM DESIGN

UNIT I: Architecture of Embedded System, Hardware Architecture, Software Architecture, RTOS, Architecture of Kernel ,Features/ Characteristics of RTOS,. Task Scheduling, Signals, Events, Queues, Mail Boxes, Semaphores, Creation of Threads and Inter Thread Communication, Memory Management

UNIT II: Detailed study of PIC18 Family Microcontroller Architecture, Pin Description, File Structure, Status Register, PIC data formats, Directives, RISC Architecture in PIC, SFR, PIC18 Hardware Connections, PIC 18 Timers, PIC 18 Serial Port, PIC 18 Interrupts. Features of ATMEL, ARM, AVR Microcontrollers.

UNIT III: PIC 18 Instruction set, Programming using C / Assembly: Data types, time delays, I/O Programming, Data Conversion, Timer/ Counter, Serial Port, Interrupt programming, ADC,DAC, Sensor Interfacing.

UNIT IV: Clock-Driven Scheduling: Notation and Assumptions, Static, Timer Driven Scheduler, General structure of Cyclic Schedules, Cyclic Executives, Improving the Average Response Time of periodic Jobs, Scheduling Sporadic Jobs, Practical Consideration and Generalizations, Algorithms for Constructing Static Schedules, Pros and Cons of Clock-Driven Scheduling.

UNIT V: Priority-Driven Scheduling of Periodic Tasks: Static Assumption, Fixed-Priority versus Dynamic-Priority Algorithms, Maximum Schedulable Utilization, Optimality of the RM and DM Algorithms, A Schedulability Test for Fixed-Priority Tasks with Short Response Times, Schedulability Test for Fixed-Priority Tasks with Arbitrary Response Times, Sufficient Schedulability Conditions for the RM and DM Algorithms

UNIT VI: Scheduling A periodic and Sporadic Jobs in Priority-Driven Systems: Assumption and Approaches, Deferrable Servers, Sporadic Servers, Constant Utilization, Total Bandwidth, and Weighted Fair Queuing Servers, Scheduling of Sporadic Jobs, Real-time Performance for Jobs with Soft Timing Constraints.

Text Books:

1. Dr. K.V. K. K. Prasad "Embedded / Real Time System : Concepts, Design, & Programming -Black Book" Dreamtech Press Publication
2. Mohammad Ali Mazidi, Rolin D. Mckinly,Danny Causey: PIC Microcontroller and Embedded system using Assembly and C for PIC18, Pearson Education
3. Jane W.S. Liu: Real Time System, Pearson Education.

Reference Books:

1. Raj Kamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw-Hill
2. John B. Beatman, Design with PIC Microconntroller, Prentice Hall
3. Barry B. Brey, Appling PIC18 Microconntroller, Architecture, Programming and Interfacing using C and Assembly, Prentice Hall.
4. Phillip A. Laplante: Real-Time Systems Design and Analysis, (Wiley Inter Science)

1NMEF5 PROGRAM ELECTIVE-II (ii) ALGORITHMS AND COMPLEXITY THEORY

Unit I: Introduction: Mathematical Notations, Proof techniques, Elementary algorithmic, Efficiency of algorithms: Examples. Asymptomatic notations: conditional asymptomatic notations. Notation with several parameters. Operations on asymptomatic notations.

Unit II: Algorithm analysis: Analyzing control structures. Examples. Average-case analysis. Amortized analysis. Solving recurrences. Review of data structures: Arrays, Stacks, Queries, Records & Pointers, Lists, Graphs, Trees, Associative tables, Heaps.

Unit III: Greedy Algorithms: Some characteristics, Graphs: Minimum spanning trees, Shortest paths. The knapsack problem, Scheduling, Divide & Conquer: Introduction - general template, Binary search, sorting, median finding & matrix multiplication. Exponentiation, Cryptograph.

Unit IV: Dynamic programming: Examples, Principle of optimality, Knapsack problem & shortest paths. Chained matrix multiplication, Recursion, Memory function. Graphs: Traversing trees. Depth-first-search :Directed & undirected graphs : Breadth-first-search. Back tracking. Branch-and-Bound. Minimax principle.

Unit V: Probability algorithms: Introduction, pseudorandom generation. Numerical probabilistic algorithms. Monte Carlo algorithms. Las Vegas algorithms. Parallel algorithms: Basic techniques. Work & efficiency. Examples. Parallel evaluations of expressions. Parallel sorting networks & parallel sorting.

Unit VI: Computational complexity. Introduction. Information-theoretic arguments. Adversary arguments. Linear reduction, Introduction to NP-completeness. Heuristic algorithms. Approximate algorithms. NP-hard approximation problems. Approximation schemes.

Text Book: G. Brassard, P.Bratley, "Fundamentals of Algorithmics", (PHI).

Reference Books:

1. Horowitz & Sahni, "Fundamentals of Algorithms", (Galgotia).
2. Aho, Ullman, "Analysis & Design of Computer Algorithms", (Addison-Wesley).
3. Donald E.Knuth, "The Art of Computer Programming", Vol.I, Vol.II, Vol.III, (Addison-Wesley).

1NMEF5 PROGRAM ELECTIVE-II (iii) COMPUTER VISION & IMAGE PROCESSING

Unit-I: Introduction to image processing, computer vision. Digitized images: basic concepts, image digitization, sampling, and quantization, digital image properties. Data structures for image analysis: traditional data structures and hierarchical data structures.

Unit-II: Image pre-processing: pixel brightness transformation, geometrical transformation, local pre-processing, image smoothing, edge detection, scaling, parametric edge models, multi-spectral images, adaptive neighborhood pre-processing, image restoration.

Unit-III: Image Segmentation: Thresholding, threshold detection methods, optimal thresholding, Edge-based segmentation, edge image thresholding, edge relaxation, border tracing and detection, Hough transforms, region-based segmentation and matching.

Unit-IV: Shape, Region identification, contour-based shape representation and description, region-based shape representation and description, shape classes. Object recognition: knowledge representation, statistical pattern recognition, syntactic pattern recognition.

Unit-V: Image Understanding: parallel, serial processing and hierarchical control, bottom-up, model-based and combined control strategies, point distribution models, contextual image classification, scene labeling & constraint propagation, semantic region growing.

Unit-VI: Linear discrete image transforms: Fourier, Hadamard, Discrete Cosine and Wavelets. Applications of these transforms. Image data compression: predictive methods, vector quantization, Hierarchical, progressive compression. JPEG & MPEG image compression.

Text Book:
Sonka M, Hlavac H, Boyle R, "Image Processing, Analysis, and Machine Vision", (2/e) Brooks/Cole Thomson Learning.

Reference Books:
1. Gonzalez and Woods, "Digital Image Processing" (2/e) Pearson Education.
2. Forsyth, "Computer Vision" Pearson Education.
3. Chanda and Majumdar, "Digital Image Processing and Analysis" PHI.
4. Horn B K P, "Robot Vision" MIT Press, Cambridge, MA.

1NMEF6: AUDIT 1

1NMEF7 LAB-I (Based On 1NMEF1)

1NMEF8 LAB-II (Based On 1NMEF2)

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SEMESTER: SECOND

2NMEF1 INTEGRATIVE PROGRAMMING

Unit I: Object Oriented Programming: Methodology, features, design patterns and frameworks, Java classes and objects: constructors, finalizers, garbage collector, cloning objects, nested classes and interfaces, inner classes, Java I/O : Byte-oriented streams, File I/ O, Character streams, Object serialization.

Unit II: Multithreaded Programming : Threads and life cycle of a thread, Creating and running the threads. Thread class and Runnable interface. Service threads, JVM and task scheduling, thread synchronization, synchronizing methods of inner classes. Thread communication, Grouping the threads.

Unit III: Databases Programming : Model-View-Persistence design pattern, Mapping between Java objects and Data elements, JDBC and drives for RDBMS, SQL to Java type mapping, Java and Javax SQL APIs and their uses in database programming, Transaction coding, Connection pooling.

Unit IV: XML Introduction, XML structure, XML DTD creation and Schema creation, well formed and valid XML documents, XML parsers like SAX & DOM, Parsing XML documents with DOM, JDOM and SAX parsers, XML transformation using XSLT and X Path.

Unit V: Network Programming : Java approach for URLs, Sockets – TCP/ IP and Datagram sockets, Programming using sockets, Remote method invocation (RMI) : server and client development for RMI, RMI registry, JNDI service and its packages, Security : Cryptography, Secure Socket Layer, Security policy definition, Java AAS.

Unit VI: Web application development : Technology of the web, Servlet and Servlet API, building web application. Java Server Pages, JSP tags and API, JSP processing, Java coding in JSP, Web application frameworks. Robust web application development.

Text Book: Wigglesworth J & McMillan P: Java Programming: Advanced Topics, 3/e, Thomson Course Technology.

Reference Books:

1. Schildt H and Naughton P: Java : The Complete Reference, Osborne, McGraw Hill
2. Dustin R Callaway: Inside Servlet, Pearson Education, LPE
3. Larne Pekowasky: Java Server Pages, Pearson Education, LPE
4. Dietel & Dietel: WWW : How to Program, Pearson Education, LPE.

2NMEF2 SYSTEM SECURITY

UNIT-I: Introduction: Security, Attacks, Computer criminals, Method of Defense Cryptography: Substitution ciphers, Transpositions , Symmetric and asymmetric systems , cryptanalysis ,data encryption standard (DES) AES Encryption algorithms Public Key Cryptography, RSA Algorithms , Uses of Encryptions.

UNIT-II: Program Security: Secure programs, Non-malicious program errors, Computer Viruses and Other malicious code, Targeted malicious code, controls against program threats.
UNIT- III: Operating System Security: Protected Objects and methods of protection, Memory address protection, Control of access to general objects, File protection Mechanism, User Authentication: Authentication basics, Password, Biometrics.

UNIT- IV: Trusted Operating System, Security Policies, models of Security, Trusted Operating System, Design, Design elements , security features of ordinary and Trusted Operating System, Kernalised design,separation , virtualizations , Layered design , typical OS Flows assurance method , Open Source Evolutions

UNIT-V: Database Security: Security requirements for Database , Reliability and integrity, sensitive data, interface, multilevel database, Proposals for multilevel security : separations , design of Multilevel secure databases , Trusted Front-end Practical issues

UNIT-VI: Networks Security: Threats in networks, Network security controls, Firewalls Intrusion detection systems, Secure E-mail. Administrating Security : Planning , Risk Analysis , Organization security policies , Physical security.

Text Book: C.P. Pfleeger and S.L.Pfleeger, “Security in Computing”, Pearson Education (LPE)

Reference Books:

1. Stallings, “Cryptography and Network Security:” Pearson Education (LPE)
2. Matt Bishop, “Computer Security: Art and Science”, Pearson Education
3. Kaufman, Perlman, Speciner, “Network Security” PHI.
4. Eric Malwald, “Network Security: A Beginner’s Guide”, TMH.

2NMEF3 INFORMATION TECHNLOGY MANAGEMENT

Unit-I: IT and Strategy: Information revolution, Business and strategy. IT Strategy, Strategy and Success, Design Parameters, Strategic positioning, Evolution of strategy sequences and getting the right, development of a strategy ,types of strategy ,context and strategy.

Unit-II: Managing IT: IT management and its roles, It governance, It governance and strategy, Technology management process, Technology selection, Strategic aspects of technology. IT and business alignment, Risk Management ,Exploiting IT Capabilities, Deploying IT in strategic manner ,Strategic planning for information technology and frameworks , Measuring IT, Performance Measures : Balanced Score Card.

Unit-III: E- strategy: What is e- strategy. E-business and E-strategy, E-business objectives ,E-Commerce and E-Business, Making estrategy work, E-strategy and the E-economy. IT strategies for IT companies: Project Vs Product Companies , Strategies aspects for an IT product company, IT Strategic perspective for product company ,IT Strategies for Product company information Technology Strategy development, Product life cycle and project life cycles.

Unit-IV: IT strategies for Knowledge Management Knowledge Management, Knowledge Management and IT strategies, role of Knowledge Management in IT strategies for IT companies, knowledge industry and knowledge strategy knowledge workers, IT strategic services ,product and consulting . IT strategies for non –IT companies : Role of IT in non –IT companies , IT Investment decision, measurement of IT,IT strategies for Non-IT companies, IT supply chain management and constraint management, IT enabled supply chain management.

Unit-V: IT Strategies in specific scenario, Enterprise resource planning implementation, mapping IT strategies initiatives to ERP ,supply chain contribution and business strategy, IT strategies for business process outsourcing, IT strategy implementation : IT strategy implementation, Development and need of it strategic plan ,IT strategy implementation to gain competitive advantage, IT strategy and leadership, IT strategy and differentiation , Execution and IT strategy.

Unit-VI: Global dimension of It Strategy: IT strategies in global environment, Global product cycle, Making It global scenario, globalization and competitive strategy, global project management, Mergers and acquisitions ,IT compatibility in M&A.

Text Book: Parag Kulkarni, Pradip K Chande "IT Strategy for Business", OXFORD University Press.

Reference Books:

1. Earl. M, "Management Strategies for Information Technology", Prentice Hall.
2. Gottschalk, P "Strategic Knowledge Managements Technology " IGP USA
3. Hill, C and G Jones "Strategic management "Houghton Miffen USA
4. Honeycutt J "Knowledge management Strategies", Microsoft Press USA.

2NMEF4 Program Elective- III (i)) SOFTWARE TESTING

Unit I: Introduction of testing: Goals for testing, phases in a tester's mental life, test design, testing versus debugging, designer versus tester, model for testing project overview, environment, the program, bugs test, testing & levels, the role of models.

Unit II: Software testing process: verification & validation, testing team & development team, characteristics of test engineers, level of testing, testing approaches, test plan, manual testing & its limitations / drawbacks.

Unit III: Flow graphs and path testing: path testing basics, predicates, path predicates and achievable paths, path sensitizing, implementation and application of path testing, transaction - flow testing techniques.

Unit IV: Testing of object oriented systems: peimer on object oriented software, differences in OO testing, software test automation: what to automate, steps of automation, design and architecture for automation, process model for automation, selecting a test tool.

Unit V: Software testing tools overview: Win Runner, testing and application using WinRunner, test script language, data driven testing, silk test, load runner, test director.

Unit VI: Source code testing utilities in UNIX/LINUX environment: GNU tools, timing of programs, profiler, code optimization, productivity tools, portability testing tool, testing application using QTP.

Text Book :

1) Boris Beizer: Software Testing Techniques, Dreamtech Press, 2nd edition.
2) Srinivasan Desikan, Gopalaswamy Ramesh : Software Testing Principle and Practices, Pearson Education.
3) Dr. K.V.K.K. Prasad : Software Testing Tools, Dreamtech Press, 2006 edition.

2NMEF4 Program Elective- III (ii) MOBILE COMPUTING

Unit I: Characteristics, Fundamentals and Infrastructure of cellular system, Satellite system, Network protocol, Ad Hoc and sensor network, Wireless MAN's, LAN's and PAN's. Mobile Ratio Propagation: Types of Radio waves, Propagation mechanism, Free space propagation, Land propagation, Path loss, Slow fading, Fast fading, Doppler effect, Delay spread, Coherence Bandwidth ,Inter symbol and Co-channel Interferences.

Unit II: Cellular Concept: Cell area, Signal strength and cell parameter, Capacity of a cell, Frequency reuse, Cluster, Co-channel Interference, Cell Splitting, Cell sectoring. Channel allocation: Static allocation verses Dynamic allocation, fixed channel allocation (FCA), Dynamic channel allocation, Hybrid channel allocation (HCA), Allocation in specialized system structure, System Modeling.

Unit III: Mobile communication systems: Cellular system infrastructure, Registration, Handoff parameter and underlying support Roaming support, Multicasting, Security and privacy, Firewall and system security. Exiting wireless system: AMPS, IS-41, GSM, IMT-2000.

Unit IV: Ad hoc And sensor network: Characteristic of MANET, Applications, Routing, Table – driven routing protocol, Source initiated On- demand Routing, Hybrid protocol, Wireless sensor network, Fixed wireless sensor networks.

Unit V: Wireless MANs, LANs and PAN's: Wireless metropolitan area networks (WMANs), Wireless Local Area networks (WLANs), and Wireless Personal Area networks (WPANs), Recent Advances, Introduction, and Ultra – wideband technology.

Unit VI: Multimedia services requirement, Push –to-talk (PTT) technology, Mobility and resources management for Integrated system, Multicast in Wireless networks, Directional and smart antennas, Design issue in sensor networks, Bluetooth network, Low - power design, XML, Threat and security issue..

Text Book: Agrawal D P and Zeng Q A, "Introduction to Wireless and Mobile Systems", (CENGAGE) (2/e).

Reference Books:

1. Jochen Schiller, "Mobile Communication", (Pearson Education) Second Edition.
2. C.K. Toh, "Ad Hoc Mobile Wireless Networks: Protocols & Systems", (Pearson Edu.)
3. Rajkamal, "Mobile Computing" (Oxford University Press).
4. George A, "Mobile Ad Hoc Networks: From Wireless LANs to 4G Networks" (TMH).

2NMEF4 Program Elective III (iii) DATA WARE HOUSING & DATA MINING

Unit I: Need for Data Warehousing: Operational Vs. Decisional support system, data warehouse defined, data warehouse users, benefits of data warehousing: tangible benefits, intangible benefits. Features of a data warehouse. Subject oriented data. Integrated data, data cleansing, data transformation, non volatile data, time varient data, data granularity, benefits of data granularity, data granularity - pros and cons, dual levels of data granularity, the information flow mechanism.

Unit II: Metadata. Role of metadata, classification of metadata, metadata management. Direct access mode, indirect access mode. Data warehouse architecture, the two tier architecture, three tier architecture, four tier architecture, data warehouse and data marts, reasons for creating data marts, pushing and pulling data, data warehouse schema, the star schema, the snowflake schema, characteristics of a dimension table, characteristics of a fact table.

Unit III: Keys in the data warehouse schema: primary keys, surrogate keys, foreign keys. Data clustering, OLAP in the data warehouse, OLAP functions, multi dimensional analysis, OLAP and multidimensional analysis, OLAP design considerations, OLAP models, data warehouse design stage, security issues in a data warehouse. Data Mining

Unit IV: Introduction : fundamentals of data mining, data mining functionalities, classification of data mining systems, major issues in data mining, mining frequent patterns, associations and correlations, classification and prediction, cluster analysis, outlier analysis, evolution analysis.

Unit V : Market basket analysis, frequent item sets, closed item sets and association rules, frequent pattern mapping, the Apriori Algorithm, generating association rules from frequent item sets, mining multilevel association rules, mining multidimensional association rules, constrained based association rules.

Unit VI: Classification and prediction: preparing data for classification and prediction, comparing classification and prediction methods, decision tree induction, Baye's theorem, rule based classification using IF-THEN rules, classification by back propagation, rule extraction from decision tree.

Text Books :
1) Reema Thareja: Data Warehousing, Oxford Unviersity Press.
2) Paulraj Ponniah: Data Warehousing Fundamentals, John Wiley.
3) Vikram Pudi and P. Radha Krishna, Oxford University Press.

Reference Books:
1) M.H.Dunham : Data Mining Introductory and Advanced Topics, Pearson Education,
2) Han, Kamber : Data Mining Concepts and Techniques, Morgan Kaufmann, Pieter Adriaans, Dolf Zantinge.

2NMEF5- Program Elective IV (i) DIGITAL MEDIA DEVELOPMENT

Unit I: Introduction to Multimedia Systems design, Elements, Systems architecture & technologies, Objects for multimedia systems , Multimedia data interface standards, Multimedia Databases, Data Compression need, lossy and lossless compression, binary image compression Schemes, color, grey and still video image compression , Full motion video compression , audio compression

Unit II: Data and file format standards RTF, TIFF,RIFF, MIDI, JPEG ,AVI, MPEG Standards, video and image display systems, image scanners , Digital voice and audio, Digital camera, video images and animation, Full motion video

Unit III: Telecommunications considerations for Multimedia, Specialized processors, ISDN, LAN and WAN for Enterprise Multimedia Applications, Distributed Object Model, Multimedia communication protocols (UDP , RTP , RTCP , TELNET) Multimedia Applications and Design issues, Virtual Reality Design, Components of Multimedia Systems,, Application Workflow & Distributed Application Design Issues

Unit IV: Multimedia Authoring and User Interface, Design Considerations, Hypermedia Applications, Information Access, Object display, Hypermedia Messaging, Integrated document management

Unit V: Distributed Multimedia Systems, Components, Client-server Operation, Object Server, Network Performance Issues, Distributed Multimedia databases, Managing distributed Objects

Unit VI: System Design: Design issues, requirements, feasibility, Performance Analysis, Design for performance, Multimedia Systems Design , Extensibility and example.

Reference Books:

1. Prabhat K Andleigh and Kiran Thakrar "Multimedia Systems Design" (PHI Publications).
2. Fred Halsall," Multimedia Communications by (Pearson Publications).
3. Ze-Nian Li, Mark S.Drew,"Fundamentals of Multimedia" (Pearson Publications).
4. John K. Koegel Buford, "Multimedia Systems" (Pearson Education)

2NMEF5 Program Elective- IV (ii) DATA PREPARATION AND ANALYSIS

UNIT I: Introduction: Sources of Data, Process for Making Sense of Data, Describing Data: Overview, Observations and Variables, Types of Variables, Central Tendency, Distribution of the Data, Confidence Intervals, Hypothesis Tests.

UNIT II: Preparing Data Tables: Overview, Cleaning the Data, Removing Observations and Variables, Generating Consistent Scales Across Variables, New Frequency Distribution, Converting Text to Numbers, Converting Continuous Data to Categories, Combining Variables, Generating Groups, Preparing unstructured Data, Understanding Relationships: Overview , Visualizing Relationships Between Variables, Calculating Metrics About Relationships.

UNIT III: Identifying and Understanding Groups: Overview, Clustering, Association Rules, Learning Decision Trees from Data, Building Models from Data: Overview, Linear Regression, Logistic Regression, k-Nearest Neighbors, Classification and Regression Trees.

UNIY IV: Data Preparation, Analysis, Deployment, Data Visualization: Overview, Visualization Design Principles, Tables, Univariate Data Visualization, Bivariate Data Visualization, Multivariate Data Visualization, Visualizing Groups, Dynamic Techniques.

Unit V: Clustering: Overview, Distance Measures, Agglomerative Hierarchical Clustering, Partitioned-Based Clustering, Fuzzy Clustering.

UNIT VI: Predictive Analysis: Overview, Principal Component Analysis, Multiple Linear Regression, Discriminant Analysis, Naïve Bays Classifiers.

Text Book: 1.Making Sense of Data I & II: A practical Guide to Exploratory Data Analysis and Data Mining by Glenn J Myatt.

2NMEF5 Program Elective-IV (iii) WIRELESS COMMUNICATION AND NETWORKS

Unit I: Introduction to Wireless Telecommunication Systems and Networks, evolution of modern telecommunications infrastructure, OSI model, FDMA, TDMA, CDMA, Future Wireless Networks, Future Wireless Networks, 1 G to 4 G cellular systems, Wireless Standards Organizations.

Unit II: Cellular network hardware components, cellular network databases; SS7 signaling, cellular cluster, backhaul networks, mobility management, concepts of power management and network security, GSM network and System architecture, DECT architecture.

Unit III: CDPD, GPRS and EDGE data networks, network layout, packet data transfer, GPRS protocol reference model, data rates, evolution of GSM and NA-TDMA to 3 G.

Unit IV: Wireless modulation techniques and hardware : spread spectrum modulation, ultra wideband radio technology, BSC and RBS hardware, digital modulation techniques : OFDM, subscriber devices.

Unit V: Wireless LANs / IEEE 802.1x : evolution, architecture, Wi-Fi system, WLAN FHSS and DSSS physical layer, wireless LAN hardware and system deployment strategies.

Unit VI: PANs and WLANs, IEEE 802.15.1 standard, Bluetooth protocol stack, Bluetooth link controller, Broadband wireless MANs/ IEEE 802.16x, IEEE 802.16 physical layer, WiMax System, Broadband satellite applications, emerging wireless technologies, wireless sensor networks.

Text Book : Gary Mullett, Wireless Telecommunications Systems and Networks, Thomson Delmar Learning, 2006.

Reference Books :
1. Jochen Schiller, Mobile Communications.
2. William Stallings, Wireless Communications and Networks.
3. T.S. Rappaport, Wireless Communications.

2NMEF6: AUDIT-II

2NMEF7: LAB-III (BASED ON 2NMEF1)

2NMEF8: LAB-IV (BASED ON 2NMEF2)

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SEMESTER: THIRD

3NMEF1: OPEN ELECTIVE (i) DATA ANALYTICS

UNIT I: Fundamentals of Data Analytics: Data Analytics Basics, Data Types, Analytics Types, Data Analytics Steps: Data Processing, Data Imputation, Data Cleaning, Data Transformation, Data Visualization and Data Engineering, Descriptive, Predictive and Perspective Analytics.

UNIT II: Data Analytics with Python: Data Analytics using Python, Statistical Procedures, Web Scraping in Python, Advanced Analytics, NumPy, Pandas, SciPy, Matplotlib.

UNIT III: Correlated Data Analysis: Analysis of Variance and co-variance, ANOVA results, Chi-Square Statistical Test, Examine Regression results, Regression Analysis, Linear Regression and its analysis, Logistic Regression and its analysis.

UNIT IV: Decision Trees and Cluster Analysis: Decision Tree Problem Analysis, Decision tree Construction, Decision Tree Algorithms; Applications of cluster Analysis, Definition of cluster, representing clusters, Clustering Techniques, K-Means Algorithm for Clustering, Advantages and Disadvantages of K- Means Clustering.

UNIT V: Naïve-Bayes Analysis & Support Vector Machine: Introduction, Probability, Naïve-Bayes Model, Classification , Advantages and Disadvantages of Naïve-Bayes, Support Vector Machines: Introduction, SVM Model, The Kernel Method ,Advantages and Disadvantages of SVMs.

UNIT VI: Social Media Analytics: Datasets, Analysis of social Network Dataset Features, Learning Models Validation, Association Rule Mining, Artificial Neural Networks for web analytics.

Text Books:

1. Anil Maheshwari, " Data Analytics made accessible, " Amazon Digital Publication 2014.
2. Song, Peter X K, "Correlated Data Analysis: Modeling, Analytics and Applications", Springer-Verlag NewYork 2007.
3. Glenn J Myatt, Wayne P Johnson, "Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining", Wiley 2009.

3NMEF1: OPEN ELECTIVE (ii) CLOUD COMPUTING AND VIRTUALIZATION

UNIT I: Technologies for Network-Based System-System Models for Distributed and Cloud Computing-NIST Cloud Computing Reference Architecture. Cloud Computing and Service Models:- Characteristics- Cloud Services-Cloud models (Iaas, Paas, Saas)-Cloud ecosystem and enabling technologies.

UNIT II: Computer Cluster for Scalable Parallel Computing- Clustering for Massive Parallelism, Computer Cluster and MPP Architectures, Design Principles of Computer Clusters, Cluster Job and Resource Management.

UNIT III: Architectural Design of Compute and Storage Clouds-Layered Cloud Architecture Development-Design Challenges-Inter Cloud Resource Management- Resource Provisioning and Platform Deployment-Global Exchange of Cloud Resources.

UNIT IV: Introduction-Implementation Levels of Virtualization Structure/Tools and Mechanism-Virtualization of CPU, Memory and I/O Devices-Virtual Cluster and Resource Management-Virtualization for Data Centre Automation.
UNIT V: Hadoop-Hadoop HDFS-Hadoop Map Reduce, Google-Google App Engine-GFS-Big Table-Microsoft Azure-Open Source Eucalyptus and Nimbus-OpenNebula-OpeStack and Appliances.

UNIT VI: Security management in Peer-to-peer networks-Peer trust and Reputation Systems-Trust overlay and DHT implementation-Power Trust-Securing Overlays, Cloud Security and Trust Management-Defense Strategies-Distributed Intrusion Detection-Data and Software Protection Techniques-Reputation Guided Protection of Data Centers.

Text Book:

Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.

Reference Books:

1. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing Principles and Paradigms, Wiley, 2010.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, Mc-GrawHill, 2010
3. Thomas Erl, Ricardo Puttini, Zaigham Mahmood, "Cloud Computing: Concepts, Technology & Architecture", First Edition, Prentice Hall, 2013.

3NMEF1: OPEN ELECTIVE (i) CYBER SECURITY AND DIGITAL FORENSICS

UNIT I: Introduction to Cyber Crime & Computer Security: Cyber crime and Information security, classification of cybercrimes, Cybercrime: The legal perspective, Cyber-offenses, Internet security, IDS, Firewall.
UNIT II: Overview of computer Forensics Technology: Introduction to computer forensics, use of forensics in law enforcement, employment proceedings, computer Forensics services. Types of computer Forensics Technology-Military, law, spyware and Adware, Biometrics security systems.
UNIT III: Computer Forensics evidence and capture: Data recovery, evidence collection and data seizure, duplication and preservation of digital evidence, computer image verification and authentication
UNIT IV: Computer Forensics Analysis: Discovery of electronic evidence- electronic document discovery, identification of data- Time keeping, forensic identification and analysis of technical surveillance devices. Reconstructing fast events
UNIT V: The information warfare Arsenal and Tactics of terrorists and Rogues: The Terrorist profile, the dark world of the cyber underground, new tools of terrorism, information warfare, Arsenal and Tactics of private companies.
UNIT VI: Civilian casualties: The violation of privacy during information words. The individual exposed. Advanced computer Forensics systems and future directions advanced encryption, hacking, advanced trackers, case studies.
Text Books:
1. Cyber Security: Belapure: wiley.
2. By John R. Vacca, "Computer forensics: computer crime scene investigation", Volume .

Reference Books:
1. EnCase Computer Forensics . Sybex
2. Computer Forensics: Incident Response Essentials, Warren G. Kruse II & Jay G. Heiser
3. Computer Forensics & Privacy, Michael Caloyannides
4. Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, edited by Albert J. Marcella Jr. & Robert S. Greenfield
5. Handbook of Computer Crime Investigation, edited by Eoghan Casey.

3NMEF2: SEMINAR AND DISSERTATION-PHASE-I

(As per given in the Scheme)

FOURTH SEMESTER

4NMEF1: SEMINAR AND DISSERTATION-PHASE-II

(As per given in the Scheme)

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