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1701CP101- APPLIED PROBABILITY AND STATISTICS

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OBJECTIVES:

- To introduce the basic concept of Probability function
- To enable the students in handling Estimation and Testing of Hypothesis
- To learn the Application of Statistics in Engineering Decision Making

UNIT I: INTRODUCTION TO PROBABILITY (9+3)

Basic definitions and rules for Probability. Properties Conditional Probability- Independent Events- Mutually exclusive Events- Total Probability- Baye'Theorem

UNIT II: RANDOM VARIABLES (9+3)

One dimensional Random Variable- Moments- Moment Generating Function- Functions of Random Variable- Two Dimensional Random Variable - Correlation

UNIT III: ESTIMATION THEORY (9+3)

Estimation: Point and Interval estimates for population parameters of large sample and small samples, determining the sample size- unbiased Estimators- Maximum Likelihood Estimation -Curve Fitting by Principle of Least square

UNIT IV: TESTING OF HYPOTHESIS- PARAMETRIC TESTS (9+3)

Hypothesis testing: one sample and two sample tests for means and proportions of large samples z-test, one sample and two sample tests for means of small sample t-test, F-test for two sample standard deviations, ANOVA one and two way.

UNIT V: NON PARAMETRIC TESTS (9+3)

Chi-square test for single sample standard deviation. Chi-square tests for independence of attributes and goodness of fit. Sign test for paired data. Rank sum test. Comparing two populations. Mann – Whitney U test and Kruskal Wallis test.

TOTAL : 45+15 = 60 PERIODS

OUTCOMES: EMPLOYABILITY

On completion of the course the students will be able to

CO1 Acquire knowledge in basic concepts of Probability
CO2 Deal with one dimensional and two dimensional Random Variable
CO3 Estimate the sample size and prediction of unknown values
CO4 Solve Parametric and non parametric statistical problem
CO5 Apply statistical techniques for solving Engineering problems

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REFERENCES:

1. Jay L. Devore, "Probability and Statistics For Engineering and the Sciences",Thomson and Duxbury, 2002.
2.Richard Johnson. "Miller & Freund's Probability and Statistics for Engineer", Prentice – Hall,Seventh Edition, 2007.
3.Richard A. Johnson and Dean W. Wichern, "Applied Multivariate Statistical Analysis", Pearson Education, Asia, Fifth Edition, 2002.
4.Gupta S.C. and Kapoor V.K."Fundamentals of Mathematical Statistics", Sultan and Sons, 2001.
5.Dallas E Johnson , "Applied Multivariate Methods for Data Analysis", Thomson an Duxbury press,1998.

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1702CP102-ADVANCED DATA STRUCTURES AND ALGORITHMS

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OBJECTIVES

- To understand the implementation and use of advanced data structures.
- To learn how to analyze the space and time requirements of a given algorithm.
- To design efficient algorithms using algorithmic techniques.

UNIT I COMPLEXITY ANALYSIS AND ELEMENTARY DATA STRUCTURES 9

Asymptotic notations – Properties of big oh notation – Asymptotic notation with several parameters – Conditional asymptotic notation – Amortized analysis – NP Completeness - Arrays – Linked lists – Trees.

UNIT II HEAP STRUCTURES AND AMORTIZED ANALYSIS 9

Min-max heaps – D-Heaps – Leftist heaps –Binomial heaps – Fibonacci heaps – Skew heaps - Lazy binomial heaps- Amortized analysis – Binomial heaps – Skew heaps – Fibonacci heaps

UNIT III SEARCH STRUCTURES 9

Binary search trees – AVL trees – 2-3 trees – 2-3-4 trees – Red-black trees – B-trees – Splay trees- Hashing and collision resolution.

UNIT IV GREEDY AND DIVIDE AND CONQUER 9

Knapsack problem- Minimum spanning trees: Prim's algorithm - Kruskal's algorithm -Tree-vertex splitting – Job sequencing with deadlines – Optimal storage on tapes - Quicksort – Strassen's matrix multiplication – Convex hull.

UNIT V DYNAMIC PROGRAMMING AND BACKTRACKING 9

Multistage graphs – 0/1 knapsacks using dynamic programming – Flow shop scheduling – 8-queens problem – Graph coloring – Knapsack using backtracking- Hamiltonian cycles.

Total: 45 PEROIDS

OUTCOMES EMPLOYABILITY

CO1 Understand the properties of various data structures and analyze different algorithm design techniques
CO2 Design and employ appropriate data structures for solving real time applications.
CO3 Implementation of advanced search structure with problem solving
CO4 Implementation and understand the complexity analysis of algorithms using greedy method and divide and conquer methods
CO5 Analyze algorithms using dynamic programming and backtracking.

REFERENCES

1. Mark Allen Weiss, *Data Structures and Algorithms in C++*, Pearson, 2009.
2. E. Horowitz, S. Sahni and S. Rajasekaran, *Computer Algorithms / C++*, University Press, 2007.
3. Adam Drozdex, *Data Structures and* algorithms in C++. New Delhi: Thomson learning, 2006.
4. T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, *Introduction to Algorithms*, Prentice hall of India, 2003.

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1702CP103-ADVANCED COMPUTER ARCHITECTURE

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OBJECTIVES

- To introduce the fundamental techniques based on parallel processing.
- To develop the foundations for analyzing the benefits of design options in computer architecture.
- To give experience of the application of the various computing techniques.

UNIT I PIPELINING AND ILP

9

Fundamentals of computer design - Measuring and reporting performance - Instruction level parallelism and its exploitation - Concepts and challenges - Overcoming data hazards with dynamic scheduling – Dynamic branch prediction – Speculation-Multiple issue processors.

UNIT II ADVANCED TECHNIQUES FOR EXPLOITING ILP

9

Compiler techniques for exposing ILP - Limitations on ILP for realizable processors - Hardware versus software Speculation - Multithreading: Using ILP support to exploit Thread-level parallelism - Performance of advanced multiple issue processors-Efficiency in advanced multiple issue processors.

UNIT III MULTIPROCESSORS

9

Symmetric and distributed shared memory architectures – Cache coherence issues - Performance Issues – Synchronization issues – Models of memory consistency - Interconnection networks – Buses, crossbar-Multi-stage switches.

UNIT IV MEMORY HIERARCHY

9

Introduction - Optimizations of cache performance - Memory technology and optimizations - Protection: Virtual memory and virtual machines-Design of memory hierarchies.

UNIT V STORAGE SYSTEMS

9

Advanced topics in disk storage- Definition and examples of real faults and failures-I/O performance, reliability measures and benchmarks-A Little queuing theory

Total: 45 Hours

OUTCOMES

EMPLOYABILITY

CO1 Analyze the working principle of different ILP and TLP techniques
CO2 Demonstrate the concepts of multiprocessor architecture
CO3 Identify the need of cache and virtual memory.
CO4 Apply the concept of memory hierarchy for efficient memory design and virtual memory to overcome the memory wall
CO5 Interpret the performance of the I/O devices during the occurrence of real faults and failures.

References

1. John L. Hennessey and David A. Patterson, *Computer Architecture – A quantitative approach.* Noida:
Morgan Kaufmann / Elsevier, 2012.

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2. William Stallings, *Computer Organization and Architecture – Designing for Performance.* New Delhi: Pearson Education, 2006.
3. David E. Culler and Jaswinder Pal Singh, *Parallel Computing Architecture: A hardware/ software approach.* Noida: Morgan Kaufmann / Elsevier, 1999.

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1702CP104-ADVANCED OPERATING SYSTEMS

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OBJECTIVES:

- To learn the fundamentals of Operating Systems
- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
- To gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
- To know the components and management aspects of Real time, Mobile operating systems

UNIT I FUNDAMENTALS OF OPERATING SYSTEMS 9

Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling – Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.

UNIT II DISTRIBUTED OPERATING SYSTEMS 9

Issues in Distributed Operating System – Architecture – Communication Primitives – Lamport's Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT III DISTRIBUTED RESOURCE MANAGEMENT 9

Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol – Security and Protection.

UNIT IV REAL TIME AND MOBILE OPERATING SYSTEMS 9

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management – File system.

UNIT V CASE STUDIES 9

Linux System: Design Principles - Kernel Modules - Process Management Scheduling – Memory Management - Input-Output Management - File System - Interprocess Communication. iOS and Android: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer – File System.

TOTAL: 45 PERIODS

OUTCOMES: EMPLOYABILITY

Upon Completion of the course, the students should be able to:

CO1 Discuss the various synchronization, scheduling and memory management issues

CO2 Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system

CO3 Discuss the various resource management techniques for distributed systems

CO4 Identify the different features of real time and mobile operating systems

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CO5 Install and use available open source kernel
CO6 Modify existing open source kernels in terms of functionality or features used

REFERENCES:

1. Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.
2. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts", Seventh Edition, John Wiley & Sons, 2004.
3. Daniel P Bovet and Marco Cesati, "Understanding the Linux kernel", 3rd edition, O'Reilly, 2005.
4. Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, 2006.
5. Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", Fourth Edition, Payload media, 2011.

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1702CP105-DESIGN AND MANAGEMENT OF COMPUTER NETWORKS

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OBJECTIVES:

- To learn definitions of network analysis, architecture, and design
- To study about different types of requirements from the user, application, device and network components.
- To learn about how to group requirements together and to map the locations of applications and devices.
- To learn how to identify and characterize traffic flows
- To develop internal and external relationships within and between major functions like addressing and routing

UNIT I INTRODUCTION TO NETWORK MANAGEMENT 9

Overview of Analysis, Architecture and Design Process-System Methodology, Service methodology, Service Description - Service characteristics - Performance Characteristics - Network supportability - Requirement analysis – User Requirements – Application Requirements – Device Requirements – Network Requirements – Other Requirements - Requirement specification and map.

UNIT II REQUIREMENTS ANALYSIS 9

Requirement Analysis Process – Gathering and Listing Requirements- Developing service metrics – Characterizing behavior – Developing RMA requirements – Developing delay Requirements - Developing capacity Requirements - Developing supplemental performance Requirements – Requirements mapping – Developing the requirements specification

UNIT III FLOW ANALYSIS 9

Individual and Composite Flows – Critical Flows - Identifying and developing flows – Data sources and sinks – Flow models- Flow prioritization – Flow specification algorithms – Example Applications of Flow Analysis

UNIT IV NETWORK ARCHITECTURE 9

Architecture and design – Component Architectures – Reference Architecture – Architecture Models – System and Network Architecture – Addressing and Routing Architecture – Addressing and Routing Fundamentals – Addressing Mechanisms – Addressing Strategies – Routing Strategies – Network Management Architecture – Network Management Mechanisms Performance Architecture – Performance Mechanisms – Security and Privacy Architecture – Planning security and privacy Mechanisms

UNIT V NETWORK DESIGN 9

Design Concepts – Design Process - Network Layout – Design Traceability – Design Metrics –Logical Network Design – Topology Design – Bridging, Switching and Routing Protocols- Physical Network Design – Selecting Technologies and Devices for Campus and Enterprise Networks – Optimizing Network Design

TOTAL: 45 PERIODS

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OUTCOMES: EMPLOY ABILITY

The Students should be able to

CO1 Gather, derive, define and validate real requirements for the specified network.

CO2 Implement how and where addressing and routing, security, network management, and performance are required in the network

CO3 Evaluate and select vendors, vendor products, and service providers for the project

CO4 Develop traceability between requirements, architecture decisions, and design decisions

CO5 Apply routing protocols (RIP/RIPv2, OSPF, BGP-4, MPLS), as well as classful and classless IP addressing mechanisms.

REFERENCES:

1. Network Analysis, Architecture, and Design By James D. McCabe, Morgan Kaufmann, Third Edition, 2007.ISBN-13: 978-0123704801
2. Computer Networks: A Systems Approach by Larry L. Peterson, Bruce S. Davie - 2007, Elsevier Inc.
3. Top-down Network Design: [a Systems Analysis Approach to Enterprise Network Design] By Priscilla Oppenheimer, Cisco Press , 3rd Edition, ISBN-13: 978-1-58720- 283-4 ISBN-10: 1- 58720-283-2
4. Integrated Management of Networked Systems: Concepts, Architectures, and Their Operational Application (The Morgan Kaufmann Series in Networking), Heinz-Gerd Hegering, Sebastian Abeck, and Bernhard Neumair, 1999.
5. "Network Design and Management" – by Steven T.Karris, Orchard publications, Second edition, Copyright 2009, ISBN 978-1-934404-15-7
6. "Network Design, Management and Technical Perspective", Teresa C. Mann-Rubinson and Kornel Terplan, CRC Press, 1999

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1704CP106-ADVANCED DATA STRUCTURES LABORATORY

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OBJECTIVES:

- To learn to implement iterative and recursive algorithms.
- To learn to design and implement algorithms using hill climbing and dynamic programming techniques.
- To learn to implement shared and concurrent objects.
- To learn to implement concurrent data structures.

LAB EXERCISES:

Each student has to work individually on assigned lab exercises. Lab sessions could be scheduled as one contiguous four-hour session per week or two two-hour sessions per week. There will be about 15 exercises in a semester. It is recommended that all implementations are carried out in Java. If C or C++ has to be used, then the threads library will be required for concurrency. Exercises should be designed to cover the following topics:

1. Implementation of Binary Search Tree
2. Implementation of Fibonacci Heaps
3. Implementation of Red-Black tree
4. Implementation of Spanning Tree
5. Implementation of Shortest Path Algorithms
6. Implementation of Graph Traversals
7. Implementation of Greedy Algorithms
8. Implementation of Approximation Algorithms

OUTCOMES: EMPLOY ABILITY

TOTAL :60 PERIODS

Upon completion of the course, the students will be able to

CO1 Design and apply iterative and recursive algorithms
CO2 Design and implement algorithms using the hill climbing and dynamic programming and recursive backtracking techniques
CO3 Design and implement optimization algorithms for specific applications
CO4 Design and implement randomized algorithms
CO5 Design appropriate shared objects and concurrent objects for applications
C06 Implement and apply concurrent linked lists, stacks, and queues

REFERENCES:

1. Jeff Edmonds, "How to Think about Algorithms", Cambridge University Press, 2008.
2. M. Herlihy and N. Shavit, "The Art of Multiprocessor Programming", Morgan Kaufmann, 2008.
3. Steven S. Skiena, "The Algorithm Design Manual", Springer, 2008.
4. Peter Brass, "Advanced Data Structures", Cambridge University Press, 2008.
5. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, "Algorithms" , McGrawHill, 2008.
6. J. Kleinberg and E. Tardos, "Algorithm Design", Pearson Education, 2006.
7. T. H. Cormen, C.2 E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms", PHI Learning Private Limited, 2012.

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1704CP107-CASE STUDY – OPERATING SYSTEMS DESIGN

(Team Work)

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OBJECTIVES:

- To develop capabilities to work at systems level
- To learn about issues in designing and implementing modern operating systems
- To understand team formation, team issues, and allocating roles and responsibilities
- To make effective presentations on the work done
- To develop effective written communication skills

LAB EXERCISES:

A team of three or four students will work on assigned case study / mini-project. Case Study / Mini-project can be designed on the following lines:

1. Development of a reasonably sized dynamically loadable kernel module for Linux kernel

2. Study educational operating systems such as Minix (http://www.minix3.org/), Weenix (http://weenix.cs.brown.edu/mediawiki/index.php/Weenix) and develop reasonably sized interesting modules for them

3. Study the Android open source operating system for mobile devices (http://source.android.com/) and develop / modify some modules.

4. Study any embedded and real-time operating system such as eCos (http://ecos.sourceware.org/) and develop / modify some modules.

TOTAL : 30 PERIODS

OUTCOMES: EMPLOYABILITY

Upon completion of the course, the students will be able to

- Develop assigned modules of operating systems design carrying out coding, testing, and documentation work involved.
- Describe team issuses and apply suitable methods to resolve the same.
- Demonstrate individual competence in building medium size operating system components.
- Demonstrate ethical and professional attributes of a computer engineer.
- Prepare suitable plan with clear statements of deliverables, and track the same.

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REFERENCES:

1. Watts S. Humphrey, "Introduction to Team Software Process", Addison-Wesley, SEI Series in Software Engineering, 1999.
2. Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.
3. T. W. Doeppner, "Operating Systems in Depth: Design and Programming", Wiley, 2010.

1704CP108- COMMUNICATION SKILL LAB – I

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OBJECTIVES:

- To prepare students for taking BEC Vantage level examination which is an International Benchmark for English language proficiency of Cambridge English Language Assessment (CELA).
- To communicate for essential business needs.
- To acquire skills for using English in workplace effectively.

UNIT I GRAMMAR AND VOCABULARY **10**

Comparison of adjectives – forming questions – asking complex questions – expressing purpose and function – tenses – conditionals – time statements – modal verbs – active and passive voice – articles – direct and indirect speech – cause and effect – relative pronouns – expressions followed by – ing forms – countable / uncountable – acronyms – marketing terms / vocabulary – financial terms – collocations – discourse markers.

UNIT II LISTENING **7**

Purposes of listening – features of listening texts – potential barriers to listening – specific listening skills – strategies to use when listening– distinguishing relevant from irrelevant information – gap filling exercise – multiple-choice options – note completion – matching and multiple choice questions – listening for specific information, gist, topic, context and function.

UNIT III SPEAKING **10**

Word and sentence stress – clear individual sounds – turn taking – initiating and responding - intonation patterns – pronunciation – mother tongue intrusion– conversation practice – turn-taking and sustaining the interaction by initiating and responding appropriately.

UNIT IV READING **9**

Purposes of reading – potential barriers to reading – paraphrasing – identifying facts and ideas – skimming and scanning for information – matching statements with texts– spotting reference words – understanding text structure – understanding the ideas in a text – distinguishing between the correct answer and the distractor – understanding cohesion in a text – deciphering contextual meaning of words and phrases – cloze – proof reading – transcoding.

UNIT V WRITING **10**

Paragraphing a text – using appropriate connectives – editing practice –Longer Documents: writing a proposal.

Total: 45 PEROIDS

OUTCOMES: SKILL DEVELOPMENT

The students will be able to

CO1 Enable students to get International recognition for work and study.

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CO2	Use English confidently in the International business environments.
CO3	To take part in business discussion.
CO4	To read company literature, listen and understand business conversations
CO5	To write formal and informal business correspondences

REFERENCES:

1. Guy Brook-Hart, BEC VANTAGE: BUSINESS BENCHMARK Upper-Intermediate – Student's Book, 1st Edition, Cambridge University Press, New Delhi, 2006.

2. Cambridge Examinations Publishing, Cambridge BEC VANTAGE – Self-study Edition, Cambridge University Press, UK, 2005.

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1701CP201-SOFTWARE PROCESS AND PROJECT MANAGEMENT

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OBJECTIVES:

- To understand overall SDLC and adopt suitable processes
- To elicite, analyze, prioritize, and manage both functional and quality requirements
- To estimate efforts required, plan, and track the plans
- To understand and apply configuration and quality management techniques
- To evaluate, manage, and design processes

(A mini-project can be chosen by the instructor and use it as a context for the tutorials)

UNIT I DEVELOPMENT LIFE CYCLE PROCESSES 9

Overview of software development life cycle – introduction to processes – Personal Software Process (PSP) – Team software process (TSP) – Unified processes – agile processes – choosing the right process Tutorial: Software development using PSP

UNIT II REQUIREMENTS MANAGEMENT 9

Functional requirements and quality attributes – elicitation techniques – Quality Attribute Workshops (QAW) – analysis, prioritization, and trade-off – Architecture Centric Development Method (ACDM) – requirements documentation and specification – change management – traceability of requirements Tutorial: Conduct QAW, elicit, analyze, prioritize, and document requirements using ACDM

UNIT III ESTIMATION, PLANNING, AND TRACKING 9

Identifying and prioritizing risks – risk mitigation plans – estimation techniques – use case points – function points – COCOMO II – top-down estimation – bottom-up estimation – work breakdown structure – macro and micro plans – planning poker – wideband delphi – documenting the plan – tracking the plan – earned value method (EVM) Tutorial: Estimation, planning, and tracking exercises

UNIT IV CONFIGURATION AND QUALITY MANAGEMENT 9

identifying artifacts to be configured – naming conventions and version control – configuration control – quality assurance techniques – peer reviews – Fegan inspection – unit, integration, system, and acceptance testing – test data and test cases – bug tracking – causal analysis Tutorial: version control exercises, development of test cases, causal analysis of defects

UNIT V SOFTWARE PROCESS DEFINITION AND MANAGEMENT 9

Process elements – process architecture – relationship between elements – process modeling – process definition techniques – ETVX (entry-task-validation-exit) – process baselining – process assessment and improvement – CMMI – Six Sigma Tutorial: process measurement exercises, process definition using ETVX

TOTAL 45+15=60 PERIODS

OUTCOMES: EMPLOYABILITY

Upon Completion of the course, the students will be able to

CO1 Explain software development life cycle
CO2 Adopt a suitable process for software development

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CO3	Elicit functional and quality requirements
CO4	Analyze, prioritize, and manage requirements
CO5	Perform trade-off among conflicting requirements

REFERENCES:

1. Pankaj Jalote, "Software Project Management in Practice", Pearson, 2002.
2. Chris F. Kemerer, "Software Project Management – Readings and Cases", McGraw Hill, 1997.
3. Watts S. Humphrey, "PSP: A self-improvement process for software engineers", Addison- Wesley, 2005.
4. Watts S. Humphrey, "Introduction to the Team Software Process", Addison-Wesley, 2000.
5. Orit Hazzan and Yael Dubinsky, "Agile software engineering", Springer, 2008.
6. James R. Persse, "Process Improvement Essentials", O'Reilly, 2006.
7. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, McGraw Hill, 2010.

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1702CP202-SECURITY IN COMPUTING

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OBJECTIVE

To understand the basics of cryptography, learn to find the vulnerabilities in programs and to overcome them, know the different kinds of security threats in networks, databases and the different solutions available, and learn about the models and standards for security.

UNIT I ELEMENTARY CRYPTOGRAPHY 9

Terminology and Background – Substitution Ciphers – Transpositions – Making Good Encryption Algorithms- Data Encryption Standard- AES Encryption Algorithm – Public Key Encryption – Cryptographic Hash Functions – Key Exchange – Digital Signatures – Certificates

UNIT II PROGRAM SECURITY 9

Secure programs – Non-malicious Program Errors – Viruses – Targeted Malicious code – Controls Against Program Threat – Control of Access to General Objects – User Authentication – Good Coding Practices – Open Web Application Security Project Top 10 Flaws – Common Weakness Enumeration Top 25 Most Dangerous Software Errors

UNIT III SECURITY IN NETWORKS 9

Threats in networks – Encryption – Virtual Private Networks – PKI – SSH – SSL – IPSec – Content Integrity – Access Controls – Wireless Security – Honeypots – Traffic Flow Security – Firewalls – Intrusion Detection Systems – Secure e-mail.

UNIT IV SECURITY IN DATABASES 9

Security requirements of database systems – Reliability and Integrity in databases – Two Phase Update – Redundancy/Internal Consistency – Recovery – Concurrency/Consistency – Monitors – Sensitive Data – Types of disclosures – Inference.

UNIT V SECURITY MODELS AND STANDARDS 9

Secure SDLC – Secure Application Testing – Security architecture models – Trusted Computing Base – Bell-LaPadula Confidentiality Model – Biba Integrity Model – Graham-Denning Access Control Model – Harrison-Ruzzo-Ulman Model – Secure Frameworks – COSO – CobiT – Compliances – PCI DSS – Security Standards - ISO 27000 family of standards – NIST.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fourth Edition, Pearson Education, 2007.
2. Matt Bishop, "Introduction to Computer Security", Addison-Wesley, 2004.
3. Michael Whitman, Herbert J. Mattord, "Management of Information Security", Third Edition, Course Technology, 2010.

OUTCOMES: EMPLOYABILITY

The students will be able to

CO1	Apply various cryptographic algorithms
CO2	Find the vulnerabilities in programs and to overcome them
CO3	Analyze different kinds of security threats

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CO4 Demonstrate the requirement of databases security and solutions to attain it
CO5 Implement Models and standards of security

REFERENCES:

1. William Stallings, "Cryptography and Network Security : Principles and Practices", Fifth Edition, Prentice Hall, 2010.
2. Michael Howard, David LeBlanc, John Viega, "24 Deadly Sins of Software Security: Programming Flaws and How to Fix Them", First Edition, Mc Graw Hill Osborne Media, 2009.
3. Matt Bishop, "Computer Security: Art and Science", First Edition, Addison-Wesley, 2002.
4. https://www.owasp.org/index.php/Top_10_2010
5. https://www.pcisecuritystandards.org/security_standards/pci_dss.shtml
6. http://cwe.mitre.org/top25/index.html

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1702CP203-INTERNET OF THINGS

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OBJECTIVES :

- To understand the fundamentals of Internet of Things.
- To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- To apply the concept of Internet of Things in the real world scenario

UNIT I FUNDAMENTALS OF IOT 9

Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs – IoT vs M2M.

UNIT II IOT DESIGN METHODOLOGY 9

IoT systems management–IoT Design Methodology–Specifications Integration and Application Development.

UNIT III BUILDING IOT WITH RASPBERRY PI 9

Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages – Web services

UNIT IV BUILDING IOT WITH GALILEO/ARDUINO 9

Intel Galileo Gen2 with Arduino- Interfaces - Arduino IDE – Programming - APIs and Hacks

UNIT V CASE STUDIES and ADVANCED TOPICS 9

Various Real time applications of IoT- Connecting IoT to cloud – Cloud Storage for Iot – Data Analytics for IoT – Software & Management Tools for IoT

TOTAL: 45 PERIODS

OUTCOMES: EMPLOYABILITY

Upon the completion of the course the student should be able to

CO1 Design a Domain specific IoTs and analyze its characteristics
CO2 Design a portable IoT using Arduino/ equivalent boards and relevant protocols.
CO3 Develop web services to access/control IoT devices.
CO4 Deploy an IoT application and connect to the cloud.
CO5 Analyze applications of IoT in real time scenario

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.

2. Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014.

3. Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.

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1702CP204-ADVANCED DATABASES

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OBJECTIVES:

- To learn the modeling and design of databases.
- To acquire knowledge on parallel and distributed databases and its applications.
- To study the usage and applications of Object Oriented database
- To understand the principles of intelligent databases.
- To understand the usage of advanced data models.
- To learn emerging databases such as XML, Cloud and Big Data.
- To acquire inquisitive attitude towards research topics in databases.

UNIT I PARALLEL AND DISTRIBUTED DATABASES **9**

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Case Studies

UNIT II OBJECT AND OBJECT RELATIONAL DATABASES **9**

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

UNIT III INTELLIGENT DATABASES **9**

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications- Design Principles for Active Rules- Temporal Databases: Overview of Temporal Databases- TSQL2- Deductive Databases: Logic of Query Languages – Datalog- Recursive Rules-Syntax and Semantics of Datalog Languages- Implementation of Rules and Recursion- Recursive Queries in SQL- Spatial Databases- Spatial Data Types- Spatial Relationships- Spatial Data Structures- Spatial Access Methods- Spatial DB Implementation.

UNIT IV ADVANCED DATA MODELS **9**

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models -Concurrency Control - Transaction Commit Protocols- Multimedia Databases- Information Retrieval- Data Warehousing- Data Mining- Text Mining.

UNIT V EMERGING TECHNOLOGIES **9**

XML Databases: XML-Related Technologies-XML Schema- XML Query Languages- Storing XML in Databases-XML and SQL- Native XML Databases- Web Databases- Geographic Information Systems- Biological Data Management- Cloud Based Databases: Data Storage Systems on the Cloud- Cloud Storage Architectures-Cloud Data Models- Query Languages- Introduction to Big Data-Storage-Analysis.

TOTAL: 45 PERIODS

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OUTCOMES: EMPLOYABILITY

Upon completion of the course, the students will be able to

CO1 Select the appropriate high performance database like parallel and distributed database
CO2 Model and represent the real world data using object oriented database
CO3 Embed the rule set in the database to implement intelligent databases
CO4 Represent the data using XML database for better interoperability
CO5 Handle Big data and store in a transparent manner in the cloud

REFERENCES:

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database SystemConcepts", Fifth Edition, McGraw Hill, 2006.
4. C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
5. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill, Third Edition 2004.

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1702CP205-MACHINE LEARNING TECHNIQUES

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OBJECTIVES:

- To understand the machine learning theory
- To implement linear and non-linear learning models
- To implement distance-based clustering techniques
- To build tree and rule based models
- To apply reinforcement learning techniques

UNIT I FOUNDATIONS OF LEARNING **9**

Components of learning – learning models – geometric models – probabilistic models – logic models – grouping and grading – learning versus design – types of learning – supervised – unsupervised – reinforcement – theory of learning – feasibility of learning – error and noise – training versus testing – theory of generalization – generalization bound – approximationgeneralization tradeoff – bias and variance – learning curve

UNIT II LINEAR MODELS **9**

Linear classification – univariate linear regression – multivariate linear regression – regularized regression – Logistic regression – perceptrons – multilayer neural networks – learning neural networks structures – support vector machines – soft margin SVM – going beyond linearity – generalization and overfitting – regularization – validation

UNIT III DISTANCE-BASED MODELS **9**

Nearest neighbor models – K-means – clustering around medoids – silhouttes – hierarchical clustering – k-d trees – locality sensitive hashing – non-parametric regression – ensemble learning – bagging and random forests – boosting – meta learning

UNIT IV TREE AND RULE MODELS **9**

Decision trees – learning decision trees – ranking and probability estimation trees – regression trees – clustering trees – learning ordered rule lists – learning unordered rule lists – descriptive rule learning – association rule mining – first-order rule learning

UNIT V REINFORCEMENT LEARNING **9**

Passive reinforcement learning – direct utility estimation – adaptive dynamic programming – temporal-difference learning – active reinforcement learning – exploration – learning an actionutility function – Generalization in reinforcement learning – policy search – applications in game playing – applications in robot control

TOTAL : 45 PERIODS

OUTCOMES: EMPLOYABILITY

Upon Completion of the course, the students will be able to

CO1 Explain theory underlying machine learning
CO2 Construct algorithms to learn linear and non-linear models
CO3 Implement data clustering algorithms
CO4 Construct algorithms to learn tree and rule-based models
CO5 Apply reinforcement learning techniques

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REFERENCES:

1. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, "Learning from Data", AMLBook Publishers, 2012.
2. P. Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press, 2012.
3. K. P. Murphy, "Machine Learning: A probabilistic perspective", MIT Press, 2012.
4. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
5. D. Barber, "Bayesian Reasoning and Machine Learning", Cambridge University Press, 2012.
6. M. Mohri, A. Rostamizadeh, and A. Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.
7. T. M. Mitchell, "Machine Learning", McGraw Hill, 1997.
8. S. Russel and P. Norvig, "Artificial Intelligence: A Modern Approach", Third Edition, Prentice Hall, 2009.

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1703CP016-ADHOC MOBILE WIRELESS NETWORKS

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OBJECTIVES:

- To learn about the issues in the design of ad hoc and wireless sensor networks
- To understand the working of protocols in different layers of ad hoc and sensor networks
- To expose the students to different aspects in ad hoc and sensor networks
- To understand various standards and applications in ad hoc and sensor networks

UNIT I FUNDAMENTALS 9

Introduction to ad hoc networks- Differences between cellular and ad hoc wireless networks- Challenges and issues in ad hoc networks-Introduction to WSN-Single node architecture-Network architecture-Localization and positioning-Operating systems for WSN.

UNIT II MAC AND LINK MANAGEMENT 9

Fundamentals of wireless MAC protocols- Classification of MAC protocols for ad hoc networks-MAC for WSN-Low duty cycle protocols and wakeup concepts-Contention and schedule based protocols-WSN link layer-Error control-Framing-Link management.

UNIT III ROUTING 9

Design issues of routing protocols for ad hoc networks- Classification of routing protocols-Proactive, Reactive and Hybrid routing protocols-Routing in WSN-Naming and addressing-Gossiping and agentbased unicast forwarding- Energy efficient unicast- Broadcast and multicast- Geographic routing-Data-centric and content-based networking.

UNIT IV TRANSPORT LAYER AND QoS 9

Challenges of transport layer protocol in wireless environments- TCP"s challenges and design issues in ad hoc networks-Transport protocols for ad hoc networks-Transport control protocols for WSNs-Issues and challenges in providing QoS in ad hoc networks-Network layer QoS solutions- QoS Model-QoS in wireless sensor networks-Congestion control in network processing.

UNIT V STANDARDS AND APPLICATIONS 9

Wireless sensor network standards-Standards on wireless mesh networks-Applications of ad hoc and WSNs-Case study: Building military border area surveillance system, Forest fire detection system and tsunami early warning system with wireless sensor networks.

TOTAL : 45 PERIODS

OUTCOMES: EMPLOYABILITY

Upon completion of this course students should be able to

CO1 Identify different issues in wireless ad hoc and sensor networks
CO2 Analyze the protocols developed for ad hoc and sensor networks
CO3 Analyse different routing protocols and its applications

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CO4 Determine and analyse different QoS techniques in communication
CO5 Identify and discuss the standards and applications of ad hoc and sensor networks

REFERENCES:

1. SubirKumarSarkar, TGBasavaraju, C Puttamadappa, "Ad Hoc Mobile Wireless Networks", Auerbach Publications, 2008.
2. C.Siva Ram Murthy, B.S.Manoj, "Ad Hoc Wireless Networks- Architectures and Protocols", Pearson Education, 2004.
3. KazemSohraby, Daniel Minoli, TaiebZnati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley & Sons, 2007.
4. WaltenegusDargie,Christian Poellabauer, "Fundamentals of Wireless SensorNetworks", John Wiley & Sons, 2010.
5. Holger Karl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, 2005.

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1704CP206-ADVANCED DATABASE LABORATORY

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OBJECTIVES :

To study and implement the basic SQL commands.
To implement the database design in PL/SQL.
To store different types of data in a database and retrieve it from a front end.

DISTRIBUTED DATABASE

1. Consider a distributed database for a bookstore with 4 sites called S1, S2, S3 and S4.

Consider the following relations:

Books (ISBN, primary Author, topic, total Stock, price)

Book Store (store No, city, state, zip, inventoryValue) Stock

(store No, ISBN, Qty)

Total Stock is the total number of books in stock and inventory Value is the total inventory value for the store in dollars.

Consider that Books are fragmented by price amounts into: F1:

Books: price up to $20

F2: Books: price from $20.01 to $50 F3:

Books: price from $50.01 to $100 F4:

Books: price $100.01 and above

Similarly, Book Stores are divided by ZIP codes into:

S1: Bookstore: Zip up to 25000 S2: Bookstore: Zip 25001 to 50000

S3: Bookstore: Zip 50001 to 75000

S4: Bookstore: Zip 75001 to 99999

Task: Write SQL query for the following

1. Insert and Display details in each table.
2. Find the total number of books in stock where price is between $15 and $55.
3. Update the book price of book No=1234 from $45 to $55 at site S3.
4. Find total number of book at site S2.

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2. Implement deadlock detection algorithm for distributed database using wait-for graph and test with the following information.

Consider five transactions T1, T2, T3, T4 and T5 with T1 initiated at site S1 and spawning an agent at site S2 T2 initiated at site S3 and spawning an agent at site S1 T3 initiated at site S1 and spawning an agent at site S3 T4 initiated at site S2 and spawning an agent at site S3 T5 initiated at site S3

The locking information for these transactions is shown in the following table

Transactions	Data items locked by transactions	Data items transaction is waiting for	Site involved in operations
T1	X1	X8	S1
T1	X6	X2	S2
T2	X4	X1	S1
T2	X5	-	S3
T3	X2	X7	S1
T3	-	X3	S3
T4	X7	-	S2
T4	X8	X5	S3
T5	X3	X7	S3

Produce local wait for graph for each of the sites and construct global wait for graph and check for dead lock.

OBJECT ORIENTED DATABASE:

3. A University wants to track persons associated with them. A person can be an Employee or Student. Employees are Faculty, Technicians and Project associates. Students are Full time students, Part time students and Teaching Assistants.
   a) Design an Enhanced Entity Relationship (EER) Model for university database.

Write OQL for the following

i. Insert details in each object.
ii. Display the Employee details.
iii. Display Student Details.
iv. Modify person details.
v. Delete person details.

b) Extend the design by incorporating the following information.

Students are registering for courses which are handled by instructor researchers (graduate students). Faculty are advisors to graduate students. Instructor researchers' class is a category with super class of faculty and graduate students. Faculty are having sponsored research projects with a grant supporting instruction researchers. Grants are sanctioned by

different agencies. Faculty belongs to different departments. Department is chaired by a faculty. Implement for the Insertion and Display of details in each class.

PARALLEL DATABASE:

4. Consider the application for University Counselling for Engineering Colleges. The college, department and vacancy details are maintained in 3 sites. Students are allocated colleges in these 3 sites simultaneously. Implement this application using parallel database [State any assumptions you have made].
5. There are 5 processors working in a parallel environment and producing output. The output record contains college details and students mark information. Implement parallel join and parallel sort algorithms to get the marks from different colleges of the university and publish 10 ranks for each discipline.

ACTIVE DATABASE:

6. Create triggers and assertions for Bank database handling deposits and loan and admission database handling seat allocation and vacancy position. Design the above relational database schema and implement the following triggers and assertions.
   a. When a deposit is made by a customer, create a trigger for updating customers account and bank account
   b. When a loan is issued to the customer, create a trigger for updating customer's loan account and bank account.
   c. Create assertion for bank database so that the total loan amount does not exceed the total balance in the bank.
   d. When an admission is made, create a trigger for updating the seat allocation details and vacancy position.

DEDUCTIVE DATABASE:

7. Construct a knowledge database for kinship domain (family relations) with facts. Extract the following relations using rules.

Parent, Sibling, Brother, Sister, Child, Daughter, Son, Spouse, Wife, husband, Grandparent, Grandchild, Cousin, Aunt and Uncle.

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WEKA TOOL:

8. Work with Weka tool classification and clustering algorithms using the given training data and test with the unknown sample. Also experiment with different scenarios and large data set

RI D	Age	Income	Student	Credit_ rating	Class: buys_ computer
1	youth	high	no	fair	no
2	youth	high	no	excellent	no

3	middle_aged	high	no	fair	yes
4	senior	medium	no	fair	yes
5	senior	low	yes	fair	yes
6	senior	low	yes	excellent	no
7	middle_aged	low	yes	excellent	yes
8	youth	medium	no	fair	no
9	youth	low	yes	fair	yes
10	senior	medium	yes	fair	yes
11	Youth	medium	yes	excellent	yes
12	middle_aged	medium	no	excellent	yes
13	middle_aged	high	yes	fair	yes
14	senior	medium	no	excellent	no

QUERY PROCESSING

9. Implement Query Optimizer with Relational Algebraic expression construction and execution plan generation for choosing an efficient execution strategy for processing the given query.

Also design employee database and test the algorithm with following sample queries.

a) Select empid, empname from employee where experience > 5
b) Find all managers working at London Branch

XML

10. Design XML Schema for the given company database

Department (deptName, deptNo, deptManagerSSN, deptManagerStartDate, deptLocation)
Employee (empName, empSSN, empSex, empSalary, empBirthDate, empDeptNo, empSupervisorSSN, empAddress, empWorksOn) Project (projName, projNo, projLocation, projDeptNo, projWorker)

a. Implement the following queries using XQuery and XPath

i. Retrieve the department name, manager name, and manager salary for every department'
ii. Retrieve the employee name, supervisor name and employee salary for each employee who works in the Research Department.
iii. Retrieve the project name, controlling department name, number of employees and total hours worked per week on the project for each project.
iv. Retrieve the project name, controlling department name, number of employees and total hours worked per week on the project for each project with more than one employee working on it

b. Implement a storage structure for storing XML database and test with the above schema.

OUTCOMES : EMPLOYABILITY **Total: 60 PERIODS**

CO1 Work on distributed databases
CO2 Create and work on object oriented databases and Parallel Database

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CO3	Experiment on active database
CO4	Explore the features of deductive database
CO5	To work on weka tool for clustering and classification

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1704CP207-TECHNICAL SEMINAR

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OBJECTIVES:

- To expose students to the real working environment and get acquainted with the organization
- To set the stage for future recruitment by potential employers.Structure, business operations and administrative functions.

The students are expected to make a presentation on the state of research on a particular topic based on current journal publications in that topic. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models.

OUTCOMES: SKILL DEVELOPMENT

1. Apply effective strategies in literature searches using libraries resources, other e-databases.
2. Critical thinking within Seminar is grounded on the processes of analysis, synthesis and evaluation necessary to read with understanding.

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1704CP208- Communication Skills Lab II

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OBJECTIVES :

- To prepare students for taking BEC Vantage level examination conducted by the Cambridge English Language Assessment (CELA).
- To communicate appropriately in business contexts.
- To acquire skills for using English in business environment.

UNIT I SPEAKING 6

Non-verbal communication – agreeing / disagreeing, reaching decisions, giving and supporting opinions – making mini presentations – extending on conservations – collaborative task – tongue twisters.

UNIT II WRITING 9

Business letters – fax – Shorter Documents: e-mail - memo – message - note – report writing – formal / informal styles.

Total: 15 Periods

OUTCOMES : SKILL DEVELOPMENT

The students will be able to

- Enable students to acquire business terms for communication.
- Use English confidently in the business contexts.
- Take part in business discussion and write formal and informal business correspondences.

REFERENCES

1 Guy Brook-Hart, BEC VANTAGE: BUSINESS BENCHMARK Upper-Intermediate – Student's Book, 1st Edition, Cambridge University Press, New Delhi, 2006.
2 Cambridge Examinations Publishing, Cambridge BEC VANTAGE – Self-study Edition, Cambridge University Press, UK, 2005.

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1703CP016-ADHOC MOBILE WIRELESS NETWORKS

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OBJECTIVES:

- To learn about the issues in the design of ad hoc and wireless sensor networks
- To understand the working of protocols in different layers of ad hoc and sensor networks
- To expose the students to different aspects in ad hoc and sensor networks
- To understand various standards and applications in ad hoc and sensor networks

UNIT I FUNDAMENTALS 9

Introduction to ad hoc networks- Differences between cellular and ad hoc wireless networks- Challenges and issues in ad hoc networks-Introduction to WSN-Single node architecture-Network architecture-Localization and positioning-Operating systems for WSN.

UNIT II MAC AND LINK MANAGEMENT 9

Fundamentals of wireless MAC protocols- Classification of MAC protocols for ad hoc networks-MAC for WSN-Low duty cycle protocols and wakeup concepts-Contention and schedule based protocols-WSN link layer-Error control-Framing-Link management.

UNIT III ROUTING 9

Design issues of routing protocols for ad hoc networks- Classification of routing protocols-Proactive, Reactive and Hybrid routing protocols-Routing in WSN-Naming and addressing-Gossiping and agentbased unicast forwarding- Energy efficient unicast- Broadcast and multicast- Geographic routing-Data-centric and content-based networking.

UNIT IV TRANSPORT LAYER AND QoS 9

Challenges of transport layer protocol in wireless environments- TCP"s challenges and design issues in ad hoc networks-Transport protocols for ad hoc networks-Transport control protocols for WSNs-Issues and challenges in providing QoS in ad hoc networks-Network layer QoS solutions- QoS Model-QoS in wireless sensor networks-Congestion control in network processing.

UNIT V STANDARDS AND APPLICATIONS 9

Wireless sensor network standards-Standards on wireless mesh networks-Applications of ad hoc and WSNs-Case study: Building military border area surveillance system, Forest fire detection system and tsunami early warning system with wireless sensor networks.

TOTAL : 45 PERIODS

OUTCOMES: EMPLOYABILITY

Upon completion of this course students should be able to

CO1 Identify different issues in wireless ad hoc and sensor networks
CO2 Analyze the protocols developed for ad hoc and sensor networks
CO3 Analyse different routing protocols and its applications

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CO4 Determine and analyse different QoS techniques in communication
CO5 Identify and discuss the standards and applications of ad hoc and sensor networks

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1703CP004 **CLOUD COMPUTING** **L T P C**
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OBJECTIVES:

- To introduce the broad perceptive of cloud architecture and model
- To understand the concept of Virtualization
- To be familiar with the lead players in cloud.
- To understand the features of cloud simulator
- To apply different cloud programming model as per need.
- To be able to set up a private cloud.
- To understand the design of cloud Services.
- To learn to design the trusted cloud Computing system

UNIT I CLOUD ARCHITECTURE AND MODEL **9**

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

UNIT II VIRTUALIZATION **9**

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

UNIT III CLOUD INFRASTRUCTURE **9**

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 PROGRAMMING MODEL **9**

Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments - Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim

UNIT V SECURITY IN THE CLOUD **9**

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

TOTAL: 45 PERIODS

OUTCOMES: EMPLOYABILITY
Upon Completion of the course, the students will be able to
CO1 Compare the strengths and limitations of cloud computing

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CO2	Identify the architecture, infrastructure and delivery models of cloud computing
CO3	Apply suitable virtualization concept.
CO4	Write programming paradigms
CO5	Handle cloud resource management

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1703CP010-NETWORK AND INFORMATION SECURITY

L T P C
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OBJECTIVES:

To understand the fundamentals of Cryptography

- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To design security applications in the field of Information technology

UNIT I INTRODUCTION 9

An Overview of Computer Security-Security Services-Security Mechanisms-Security Attacks- Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies.

UNIT II CRYPTOSYSTEMS & AUTHENTICATION 9

Classical Cryptography-Substitution Ciphers-permutation Ciphers-Block Ciphers-DES- Modes of Operation- AES-Linear Cryptanalysis, Differential Cryptanalysis- Hash Function - SHA 512- Message Authentication Codes-HMAC - Authentication Protocols -

UNIT III PUBLIC KEY CRYPTOSYSTEMS 9

Introduction to Public key Cryptography- Number theory- The RSA Cryptosystem and Factoring Integer-Attacks on RSA-The ELGamal Cryptosystem- Digital Signature Algorithm-Finite Fields- Elliptic Curves Cryptography- Key management – Session and Interchange keys, Key exchange and generation-PKI

UNIT IV SYSTEM IMPLEMENTATION 9

Design Principles, Representing Identity, Access Control Mechanisms, Information Flow and Confinement Problem

Secure Software Development: Secured Coding - OWASP/SANS Top Vulnerabilities – Buffer Overflows - Incomplete mediation - XSS - Anti Cross Site Scripting Libraries - Canonical Data Format - Command Injection - Redirection - Inference – Application Controls

UNIT V NETWORK SECURITY 9

Secret Sharing Schemes-Kerberos- Pretty Good Privacy (PGP)-Secure Socket Layer (SSL)- Intruders – HIDS- NIDS - Firewalls - Viruses

TOTAL: 45 PERIODS

OUTCOMES: EMPLOYABILITY

Upon Completion of the course, the students will be able to

CO1 Implement basic security algorithms required by any computing system.
CO2 Analyze the vulnerabilities in any computing system and hence be able to design a security solution
CO3 Analyze the possible security attacks in complex real time systems and their effective countermeasures
CO4 Identify the security issues in the network and resolve it.
CO5 Formulate research problems in the computer security field

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1703CO036 **NETWORK ENGINEERING AND MANAGEMENT**

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PREREQUISITE :

1. Wireless Networks
2. Ad hoc and Sensors Networks

COURSE OBJECTIVES:

1. To understand the need for interoperable network management
2. To learn to the concepts and architecture behind standards based network management
3. To understand the concepts and terminology associated with SNMP and TMN
4. To understand network management as a typical distributed application
5. To study the current trends in network management technologies

UNIT I FUNDAMENTALS OF COMPUTER NETWORK TECHNOLOGY **9 Hours**

Network Topology, LAN, Network node components- Hubs, Bridges, Routers, Gateways, Switches, WAN, ISDN Transmission Technology, Communications protocols and standards. Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network

UNIT II OSI NETWORK MANAGEMENT **9 Hours**

OSI Network management model-Organizational model-Information model, communication model. Abstract Syntax Notation - Encoding structure, Macros Functional model CMIP/CMIS.

UNIT III INTERNET MANAGEMENT(SNMP) **9 Hours**

SNMP(V1 and V2)-Organizational model-System Overview, The information model, communication model-Functional model, SNMP proxy server, Management information, protocol remote monitoring- , RMON SMI and MIB, RMON1,RMON2 - A Case Study of Internet Traffic Using RMON.

UNIT IV BROADBAND NETWORK MANAGEMENT **9 Hours**

Broadband networks and services, ATM Technology-VP,VC, ATM Packet, Integrated service, ATMLAN emulation, Virtual LAN. ATM Network Management-ATM Network reference model, integrated local management Interface.ATM Management Information base, Role of SNMD and ILMI in ATM Management, M1, M2, M3, M4Interface. ATM Digital Exchange Interface Management- , TMN conceptual Model- TM Architecture, TMN Management Service Architecture

UNIT V NETWORK MANAGEMENT APPLICATIONS **9 Hours**

Configuration management, Fault management, performance management, Event Correlation Techniques security Management, Accounting management, Report Management, Policy Based Management Service Level Management- Network Management Tools, Network Statistics Measurement Systems – Web Based Management, XML Based Network Management - : Future Directions.

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR : **TOTAL: 45 HOURS**

1. Broadband implementing technologies
2. Communication networks

COURSE OUTCOMES: EMPLOYABILITY

On the successful completion of the course, students will be able to

CO1 Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.
CO2 Apply network management standards to manage practical networks.
CO3 Formulate possible approaches for managing OSI network model.
CO4 Use on SNMP for managing the network
CO5 Use RMON for monitoring the behavior of the network

REFERENCES:

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1704CP301 Project Work Phase-I	L T P C 0 0 12 6

OBJECTIVES:

- To identify and describe the problem and scope of project
- To collect, analyze and present data into meaningful information using relevant tools
- To select, plan and execute a proper methodology in problem solving, work independently and ethically
- To present the results in written and oral format effectively and identify basic entrepreneurship skills in project management.

GUIDELINES TO BE FOLLOWED:

A student should work under a project supervisor, a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

COURSE OUTCOMES: EMPLOYABILITY / ENTREPRENEURSHIP

1. Problem Identification 1. A statement of system / process specifications proposed to be developed (Block Diagram / Concept tree) 2. List of possible solutions including alternatives and constraints 3. Cost benefit analysis 4. Timeline of activities
2. A report highlighting the design finalization [based on functional requirements and standards (if any)]
3. A presentation including the following: 1. Implementation Phase (Hardware / Software / both) 2. Testing and Validation of the developed system 3. Learning in the Project
4. Consolidated report preparation

TOTAL: 90 PERIODS

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1704CP401 Project Work Phase-II	L T P C 0 0 24 12

OBJECTIVES:

- To create and describe the problem and scope of project
- To analyze, design and present data into meaningful information using relevant tools
- To select, plan and execute a proper methodology in problem solving, work independently and ethically
- To implement and present the results in written and oral format effectively and identify basic entrepreneurship skills in project management.

GUIDELINES TO BE FOLLOWED:

A student should work under a project supervisor, a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

COURSE OUTCOMES: EMPLOYABILITY / ENTERPRENEURSHIP

1. Problem Identification 1. A statement of system / process specifications proposed to be developed (Block Diagram / Concept tree) 2. List of possible solutions including alternatives and constraints 3. Cost benefit analysis 4. Timeline of activities
2. A report highlighting the design finalization [based on functional requirements and standards (if any)]
3. A presentation including the following: 1. Implementation Phase (Hardware / Software / both) 2. Testing and Validation of the developed system 3. Learning in the Project
4. Consolidated report preparation

TOTAL: 120 PERIODS

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