Shri Vaishnav Vidhyapeeth Vishvavidhyalaya, Indore

Institute of Computer Applications

Name of Program: M.Sc.(CS)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCCS401	Compulsory	Software Testing and Project Management	3	1	0	4	60	20	20	0	0

Course Education Objectives (CEOs):

➢ To understand Software Project Management activities.

➢ To gain knowledge of Software Testing.

Course Outcomes (COs):

After successful completion of this course the students will:

- Understand the concepts of Software Project Management.
- Understand the Risk Management and Software Configuration Management .
- Learn about Software quality and Software quality assurance activities.
- Learn the basics of testing and testing methodologies.
- Understand the concepts of Computer Aided Software Engineering (CASE).
- Learn the concepts of Software Re-Engineering.

UNIT – I
Overview of Project Management: Project Management – Definitions; Factors Influencing Project Management – Project Manager, Project Management Activities, Stakeholders; Project Development Phases; Project Charter; Statement of Work (SoW).

Project Planning: Tasks in Project Planning; Work Breakdown Structures (WBS); Planning Methods; Overview of Development Life Cycle Models.

Risk Management: Concepts Risk Management; Risk Management Activities; Types of Risks; Risk Components and Drivers; Risk Prioritization.

UNIT – II
Configuration Management: Software Configuration Management (SCM) – Baselines, Software Configuration Items (SCI); SCM Process; Identification of Objects in the Software Configuration; Configuration Audit; Status Reporting; Goals of SCM.

Team Development and Conflict Management: Basic Concepts; Organization Types – Centralized-control team organization, Decentralized-control team organization, Mixed-control team organization.

UNIT – III
Software Quality Assurance: Defining Software Quality, Software Quality Assurance Activities; Software Quality Standards – ISO Standards for Software Organization, Capability Maturity Model (CMM), Techniques to enhance Software Quality.

Testing : Software Testing Concepts; Introduction to testing, Brief history of testing, Testing Opportunities, Testing Principle, Types of Software Testing – Manual Testing, Automated Testing.

UNIT – IV
Types of Testing : Functional , Non-functional, **Testing Techniques**: Boundary value analysis, Equivalent Class Partition, Error Guessing, Partition Table. Test Design, Test Methodology, Test Scenario, Test Cases, Test Case Template, Types of Test Cases.

UNIT - V
Computer Aided Software Engineering (CASE) Tools: CASE Concepts; Classification of CASE Tools; Architecture of CASE Environment, Benefits of CASE.

Software Re-Engineering: Software Maintenance Problems; Redevelopment vs. Reengineering; Software Reengineering Process Model.

Suggested Readings:
1. Software Project Management , Bob Hughes, Mike Cotterell and Rajib Mall, Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
2. Software Testing A Craftsman's Approach, Paul C. Jorgensen, Fourth Edition, CRC Press.
3. Effective Software Project Management, Robert K. Wysocki, Wiley Publication,2011.
4. Software Project Management in Practice, Pankaj Jalote, Pearson
5. Software Testing Principles and Practice, Srinivas Desikan, Gopalaswamy Ramesh, Pearson

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							THEORY			PRACTICAL	
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MSCCS402	Compulsory	Internals of LINUX	3	1	0	4	60	20	20	0	0

Legends: L – Lecture; T – Tutorial/Teacher Guided Student Activity; P – Practical; Q/A – Quiz/Assignment/Attendance; MST – Mid Semester Test.
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Course Education Objectives (CEOs):
- To understand the concepts of Linux operating system.
- To understand the commands used for operating Linux Operating System.
- To understand the File Management in Linux.
- To understand the Memory Management in Linux.

Course Outcomes (Cos):
After the successful completion of this course students will be able to
- Learn the basic concepts of Linux Operating System.
- Operate the Linux based system through basic commands.
- Understand and use the system calls to manage the overall system of Linux.
- Learn the internal management of Linux Operating System.

UNIT I
Introduction to UNIX OS : Features of UNIX, UNIX System Organization, Operating System Services, Assumption about Hardware, UNIX / Linux Basic Commands, **Text Editing** : Types of Editors, Fromed to ex to v, Basic Editor Tasks with vi, Editing Multiple Files, Named Buffers, vi Start up File, Redirection and Pipe; Shell and Types of Shell, Shell commands.

UNIT II
Architecture of UNIX Operating System, Introduction to System Concept, Kernel Data Structure, System Administration;
The Buffer Cache: Buffer Header, Structure of Buffer Pool, Buffer Retrieval, Reading and writing disks blocks, Advantages and disadvantages

UNIT III
Internal representation of files: I-nodes, Structure of a regular file, Directories, Conversion of pathname to an inode, Super block, I-node assignment to a new file, Allocation of disk block.
System calls for the file system: Open, Read, Write, File and record blocking, Adjusting the position of file I/O –seek, Close, File creation, Creation of Special Files, Change directory and change root, Change owner and change mode, Stat and fstat, Pipes, Dup, Mounting and Unmounting file systems, Link, Unlink, File System Maintenance.

UNIT IV
UNIX Processes: The UNIX Process Model, Process States, Monitoring and Controlling Processes;
The Structure of Process: Process states and transitions, Layout of system memory, The context of a process, Saving the context of a process, Manipulation of a process address space, Sleep;
Process Control: Process creation, Signals, Process termination, Awaiting process termination, Invoking other programs, The user-id of a process, Changing the size of a process, The shell, System boot and init process;

UNIT V
Process Scheduling and time: Process scheduling, System calls for time, Clock;
Memory Management Policies: Swapping, Demand paging, Hybrid system with swapping and demand paging.

Suggested Readings:
1. The Design of the UNIX Operating System, Maurice J. Bach (Pearson Education)
2. UNIX Shell Programming, Y. P. Kanetkar (BPB)
3. UNIX Concepts & Applications, Sumitabha Das (THM)
4. Advanced Programming in UNIX Environment, Richard Stevens (Pearson Education)
5. Vijay Mukhi's The C Odyssey UNIX The Open Boundless C, Meeta Gandhi,
6. Tilak Shetty, Rajiv Shah (BPB Publication)

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							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MSCCS403	Compulsory	Data Mining and Warehousing	3	1	0	4	60	20	20	0	0

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical;   C - Credit; Q/A – Quiz/Assignment/Attendance, MST - Mid Sem Test.

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Course Educational Objectives (CEOs):
- To familiarize the students with the need and scope of the subject.
- to build the mental makeup of the students for the field of data mining
- To develop a better understanding of the recent techniques like Support Vector Machine, Rough Set Theory etc as the tools of data mining.
- Using simple and well drawn illustrations develop students skills to discover knowledge to support the decision making process.
- To make the students well versed with the latest trends in data warehousing and data mining.

Course Outcomes (Cos): The student will be able to
- understand the basic principles, concepts and applications of data warehousing and data mining
- introduce the task of data mining as an important phase of knowledge recovery process
- Ability to do Conceptual, Logical and Physical design of Data Warehouses, OLAP applications and OLAP deployment
- Have a good knowledge of the fundamental concepts that provide the foundation of data mining
- Design and implement a data warehouse or data mart to present information needed by management in a form that is usable for management client
- Design and implement the data preprocessing solutions for different applications
- Identify and use suitable data mining techniques for Knowledge Discovery
- Develop dashboard solutions for presentation of knowledge
- Explore the subject to start as a researcher

UNIT – I

Data Mining: History, Motivation, Importance, Data types for Data Mining: relation Databases, Data Warehouses, Transactional databases, advanced database system and its applications, Data mining Functionalities: Concept/Class description, Association Analysis, Classification &

Prediction, Cluster Analysis, Outlier Analysis, Evolution Analysis, Classification of Data Mining Systems, Major Issues in Data Mining.

UNIT – II

Data Warehouse and OLAP Technology for Data Mining: Differences between Operational Database Systems and Data Warehouses, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse servers, Implementation of Data Warehouse.

UNIT- III

Data Preprocessing: Problems with real world data, data preprocessing as a process, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation. Data Mining Primitives, Languages, System Architecture, Concept Description: Characterization and Comparison, Analytical Characterization.

UNIT – IV

Association Rule Mining: Market Basket Analysis, Basic Concepts, Mining Single-Dimensional Boolean Association Rules: issues, Different Algorithms : the Apriori, Partition, Dynamic Itemset Counting, Pincer search, FP tree Growth, Improving the efficiency of Apriory, Mining Multilevel and Multidimensional Association Rules, Constraint-Based Association Rule Mining.

UNIT – V

Classification and Prediction: Issues regarding classification and prediction, Different Classification and clustering Methods, Prediction, Cluster Analysis, Applications and Trends in Data Mining.

Suggested Readings:
1. J. Han and M. Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Pub.
2. Berson, "Data Warehousing, Data Mining and OLAP, TMH.
3. W.H. Inmon, "Building Data Warehouse', Wiley India.
4. Anahory, "Data Warehousing in Real World", Pearson Education.
5. Adriaans, "Data Mining", Pearson Education.
6. A.K. Pujari, "Data Mining Techniques", University Press, Hyderabad.
Note: Paper is to be set unit wise with internal choice.

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MSCCS414	Elective	Network Security	4	0	0	4	60	20	20	0	0

Legends:L , Lecture; T , Tutorial/Teacher Guided Student Activity; P , Practical; Q/A , Quiz/Assignment/Attendance; MST , Mid Semester Test.

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Course Objective:
- identify some of the factors driving the need for network security
- identify and classify particular examples of attacks

Outcomes course students will be able to:
- Provide security assessment of networks.
- Use the basic concepts of secure communication via insecure networks to design secure architectures.
- Describe and justify relevant alternatives and decision recommendations.
- Implement security management in networks.

UNIT-I
Network Security, Computer and Cyber Security. Security Terminologies and Principle, Security Threats, Types of attacks (Operating System, application level, Shrink Wrap code, Misconfiguration attacks etc.)Symantec Cipher model, substitution Techniques, ran position techniques, rotor machines, steganography.
Simplified DES, block cipher principles, the data encryption standard, the strength of DES, differential and linear cryptanalysis.

UNIT-II
Block cipher design principles and modes of operation, Evaluation Criteria for AES, the AES cipher.Contemporary symmetric ciphers: Triple DES, blowfish. Confidentiality using symmetric encryption: Placement of Encryption function, traffic confidentiality, key distribution, and random number generation.
Prime numbers, Fermat's and Euler's Theorems, testing for primality, the Chinese remainder theorem, discrete logarithms. Principles of Public key cryptosystems, the RSA algorithm. Key

management, diffie-Hallman key exchange, elliptic curve arithmetic, and elliptic curve cryptography.

UNIT-III
Authentication Requirements, Authentication functions, message authentication codes, hash functions, security of hash function and MACs.MD5 message digest algorithm, secure Hash algorithm Overt and Covert Channels, Working, Types (Remote Access Trojans, Data-Sending Trojans, Destructive Trojans, Trojans, Proxy Trojans, FTP Trojans, Security Software Disablers). Viruses and Worms: Characteristics, Working, Infection Phase, Attack Phase. Sniffers: Definition,

UNIT-IV
Web Security, IP Security, Firewalls-Types, Operation, Design Principles, Trusted Systems. Computer Forensics, Objectives, Need, Stages& Steps of Forensic Investigation in Tracking Cyber Criminals, Incident Handling.
Hacking, Classes of Hacker (Black hats, grey hats, white hats, suicide hackers), Foot printing, Scanning (Types-Port, Network, Vulnerability), E-Mail Spiders, Overview of System Hacking Cycle.

UNIT-V
System Security- Intruders, intrusion detection, and password management.
Electronic Mail Security- Pretty Good privacy, MIME.
Malicious software-Viruses and related threats, virus countermeasures.

Suggested Readings:
1. William Stallings "Cryptography and Network Security", 3 ed, Pearson Education.
2. W.Stallings" Network security Essential " Applications & Standards", Pearson ed.
3. Kanfren "Network Secirity : Private Communications in a public world 2/e.
4. Eric Maiwald" NetworkSecirity : A Preginner's Guide, second ed.", Tata Mcgraw Hill.
5. Roberta Bragg " Mark Rhodes, Ousley& Keith Strassberg Network Secirity : The Complete Reference " Tata McGraw Hill.
6. Eric Maiwald "Fundamentals of Network Security" Wiley India.

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MSCCS424	Elective	Cloud Computing and Management	4	0	0	4	60	20	20	0	0

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Course Educational Objectives(CEOs):

- The goal of this course is to provide students with an understanding of basic concepts of Cloud Computing along with cloud computing architecture, cloud management and Cloud Security.

Course Outcomes (Cos):students will be able to

- Introduce the broad perceptive of cloud architecture and model
- Understand the concepts of cloud Management.
- Understand the Virtualization Technology Concepts.
- Understand the Cloud Security.
- Explore some important cloud computing driven commercial systems such as Google Apps, Microsoft Azure ,Amazon Web Services and other businesses cloud applications

UNIT 1

Cloud Computing :Introduction, Historical development, Vision, Characteristics as per NIST, reference model, Cloud computing environments,Cloud and dynamic infrastructure, Cloud Adoption and rudiments.
Cloud as a Service:Cloud Services Requirements, Pros and Cons of Cloud Service Development, Types of Cloud Service Development

UNIT 2

Architecture for Cloud Computing: Cloud Reference Model, Types of Clouds, Cloud Interoperability &Standards, Scalability and Fault Tolerance.
Cloud Solutions: Cloud Ecosystem, Cloud Business ProcessManagement, Cloud Service Management.

Cloud Offerings: Cloud Analytics, Testing Under Control, Virtual Desktop Infrastructure.

UNIT 3

Cloud Governance- High Availability and Disaster Recovery-Charging Models, Usage Reporting, Billing and Metering.
Cloud Management: Resiliency, Provisioning, Asset management, Concepts of Map reduce, Cloud Governance, High Availability and Disaster Recovery. Federated Clouds/Inter Cloud: Characterization & Definition, Cloud Federation Stack, Third Party Cloud Services.

UNIT 4

Virtualization Technology: Virtualization of computer hardware, storage, networking, desktop and application virtualization. Virtualization benefits, server virtualization, Block and file level storage virtualization Hypervisormanagement software, Infrastructure Requirements, Virtual LAN(VLAN) and Virtual SAN(VSAN) andtheir benefits.

UNIT 5

Cloud Security: Introduction of cloud Information security services, Design principles, Secure Cloud Software Requirements, Policy Implementation, and Security Challenges.
Overview of cloud applications: ECG Analysis in the cloud, Protein structure prediction, Gene Expression Data Analysis, Satellite Image Processing, CRM and ERP, Social networking.
Case study of cloud computing platforms: Google App Engine, Microsoft Azure, Hadoop. Amazon.

Suggested Readings:
1. Krutz, Vines, "Cloud Security ", Wiley Pub.
2. Kumar Saurabh, "Cloud Computing", Wiley Pub
3. Sosinsky, " Cloud Computing", Wiley Pub.
4. Velte, "Cloud Computing- A Practical Approach", TMH Pub.
5. Buyya, Selvi," Mastering Cloud Computing ", TMH Pub
6. 6.Thomas Erl, Ricardo Puttini, Zaigham Mahmood "Cloud Computing: Concepts, Technology & Architecture", Prentice Hall

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							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MCCS434	Elective	Design Methods & Analysis of Algorithms	4	0	0	4	60	20	20	0	0

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical;   C - Credit; Q/A – Quiz/Assignment/Attendance, MST - Mid Sem Test.

*Teacher Assessment shall be based on following components: Quiz/Assignment/Project/Participation in class (Given that no component shall be exceed 10 Marks)

Course Educational Objectives (CEOs):
- To familiarize the students with the need and scope of the subject.
- To develop the analytical skills of students so that they can better understand the problem and devise algorithms efficiently.
- Using simple and well drawn illustrations develop their analytical and programming skills.
- To cover the various data structures and their applications so that aspirants can explore this territory
- to take on the more challenging concepts.

Course Outcomes (Cos): After the completion of the course the student will be able to
- Understand the real world problems and model them
- Understand the algorithms and the algorithm design process
- Choose a suitable strategy to devise solution of a given problem
- identify, formulate and solve programming problems
- select appropriate data structures for the solution of a given problem
- analyze the algorithms for correctness and in terms of complexity for best, worst and average cases
- function on multi-disciplinary teams
- understand the professional and ethical responsibility

Unit-I
Pre-requisites: Data structure and Discrete structures, models of computation, **Introduction to Algorithm:** Definition, Criteria of Algorithm, Algorithm Analysis, Time and Space complexity, Asymptotic Notations: Big Oh, Omega and Theta, Best, Average and Worst case analysis.

Unit-II
Design of Algorithm: Different strategies, Recurrence Relation: Master method, Substitution method, Analysis of algorithm, Brute-force approach: Sequential search, Selection sort
Divide and Conquer: Structure of divide-and-conquer algorithms: examples; Binary search, Merge sort,
Quick sort, Strassen's Multiplication; Analysis of divide and conquer methods

Unit-III
Graph searching and Traversal: Overview, Traversal methods (depth first and breadth first search)
Greedy Method: Overview of the greedy paradigm examples of exact optimization solution (minimum cost spanning tree), Approximate solution (Knapsack problem), Single source shortest paths.
Branch and bound: LC searching, Bounding, FIFO branch and bound, LC branch and bound application: 0/1 Knapsack problem, Traveling Salesman Problem, searching & sorting algorithms.

Unit-IV
Dynamic programming: An Overview, Difference between Dynamic Programming and Divide And Conquer, Applications: Shortest Path in Graph, Matrix Chain Multiplication, Traveling Salesman Problem, Longest Common Sequence.
Back tracking: Overview, 8-queen problem and Knapsack problem

Unit-V
Computational Complexity: Complexity measures, Polynomial Vs non-polynomial time complexity; NP-hard and NP-complete classes, Relation among P, NP, NPC and NPH Examples. Combinational algorithms, string processing algorithm, Algebraic algorithms, set algorithms

Suggested Readings:
1. Ullman, "Analysis and Design of Algorithm", TMH
2. Goodman, "Introduction to the Design & Analysis of Algorithms, TMH.
3. Sara Basse, A. V. Gelder, "Computer Algorithms," Addison Wesley
4. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer algorithm," PHI
5. E. Horowitz, S. Sahni, and S. Rajsekaran, "Fundamentals of Computer Algorithms," Galgotia Publication
Note: Paper is to be set unit wise with internal choice.

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