Mandsaur University

Subject Name	L	T	P	Credit
Cloud Computing and Services	2	1	2	4

Objectives:

This course gives an introduction to cloud computing, its techniques, issues and its services that will lead to design and development of a simple cloud service. Students will be able to understand and implement the concept of Virtualization. To develop capabilities across the various cloud service models including IaaS, PaaS, SaaS, and developing cloud based software applications on top of cloud platforms.

Unit-1

Introduction: What is a cloud, Definition of cloud , Why use clouds, Characteristics of cloud computing, Driving factors towards cloud computing, Comparing grid with cloud and other computing systems, Benefits and challenges of cloud computing, Evolution of Cloud Computing, Usage scenarios and Applications, Business models around Cloud, Cloud computing environments, Cloud services requirements, Cloud and dynamic infrastructure. Overview of various cloud based applications: Satellite Image Processing, CRM and ERP, Social networking.

Unit-2

Cloud Computing Architecture:
Cloud Reference Model, Types of Clouds, Cloud Interoperability & Standards, Scalability and Fault Tolerance, Cloud Solutions: Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management. Cloud Offerings: Cloud Analytics, Testing Under Control, Virtual Desktop Infrastructure.
Services and Applications
IaaS :- Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos. PaaS :- Basic concept, tools and development environment with examples. SaaS:- Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform.

Unit -3

Cloud Virtualization & Management

Need for Virtualization, Pros and cons of Virtualization. Types of Virtualization, Desktop and application virtualization, System Vm, Process VM, Virtual Machine monitor, Virtual machine properties, Interpretation and binary translation, HLL VM, Hypervisors – Xen, KVM, VMWare, Virtual Box, Hyper-V.

Policies and mechanisms for resource management, Resiliency, Provisioning, Asset management, Concepts of Map reduce, Cloud Governance, High Availability and Disaster Recovery.

Unit -4

Security in cloud computing:
Cloud security reference model: Risks, Security, privacy, Trust. Cloud Information security fundamentals, Cloud security services, Design principles, Secure Cloud Software Requirements, Policy Implementation, Cloud Computing Security Challenges, Virtualization security Management, Cloud Computing Security Architecture.

Unit-5

Services and Applications:

Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs.

Market Based Management of Clouds, Federated Clouds/Inter Cloud: Characterization & Definition, Cloud Federation Stack, Third Party Cloud Services, IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform, A comparison of Cloud Computing Platforms, Common building Blocks.

Outcomes:

- Understanding the key dimensions of the challenge of Cloud Computing
- Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures.
- To analyze the case studies to derive the best practice model to apply when developing and deploying cloud based applications.
- Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application
- Development of cloud based applications using various cloud based platforms, Amazon Web service, Google App Engine, Microsoft Azure etc.

Text books:

1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013
2. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGraw Fill, 2010
3. Cloud Computing - Second Edition by Dr. Kumar Saurabh, Wiley India

Reference books:

1. Dan C. Marinescu, Cloud Computing: Theory and Practice, Elsevier Science, 2013
2. Cloud Computing, A Hands on approach, Arshadeep Bahga, Vijay Madisetti, University Press.

List of Practicals :

1. Create virtual machines that access different programs on same platform.
2. Create virtual machines that access different programs on different platforms.
3. Exploring Google cloud for a) Storage b) Sharing of data c) manage your calendar, to-do lists, d) a document editing tool
4. Exploring Microsoft cloud
5. Exploring Amazon cloud
6. Installation and configuration of Hadoop/Euceliptus etc.
7. Service deployment & Usage over cloud.
8. Management of cloud resources.
9. Performance evaluation of services over cloud

Subject Name	L	T	P	Credit
Compiler Design	2	1	2	4

Objectives:

- To introduce the major concept areas of language translation and compiler design.
- To introduce students to the concepts underlying the design and implementation of language processors.
- To learn context free grammars, compiler parsing techniques, construction of abstract syntax trees, symbol tables, and actual code generation.

Unit-1

Introduction of Compiler, Major data Structure in compiler, BOOT Strapping & Porting, Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, Lexical analysis: Input buffering, Specification & Recognition of Tokens, LEX.

Unit-2

Syntax analysis: CFGs, Top down parsing, Brute force approach, recursive descent parsing, Transformation on the grammars, predictive parsing, bottom up parsing, operator precedence parsing, LR parsers (SLR,LALR, LR),Parser generation. Syntax directed definitions: Construction of Syntax trees, Bottom up evaluation of S-attributed definition, L-attribute definition, Top down translation, Bottom Up evaluation of inherited attributes Recursive Evaluation, Analysis of Syntax directed definition.

Unit -3

Type checking: type system, specification of simple type checker, equivalence of expression, types, type conversion, overloading of functions and operations, polymorphic functions. Run time Environment: storage organization, Storage allocation strategies, parameter passing, Dynamic storage allocation , Symbol table.

Unit -4

Intermediate code generation: Declarations, Assignment statements, Boolean expressions, Case statements, Back patching, Procedure calls Code Generation: Issues in the design of code generator, Basic block and flow graphs, Register allocation and assignment, DAG representation of basic blocks, peephole optimization, generating code from DAG.

Unit-5

Introduction to Code optimization: sources of optimization of basic blocks, loops in flow graphs, dead code elimination, loop optimization, Introduction to global data flow analysis, Code improving transformations ,Data flow analysis of structure flow graph Symbolic debugging of optimized code.

Outcomes:

- Analysis of different phases of compiler.
- Apply lexical, semantic and syntax analysis for C programs.
- Understand the construction of parsers and symbol table.
- Apply code optimization and code generation concepts.

Text books:

1. A. V. Aho, R. Sethi, and J. D. Ullman, "Compilers:Principles,Techniques and Tools", Pearson Education.

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Reference books:

1. Mak, writing compiler & Interpreters, Willey Pub.Louden, Compiler Construction: Principles and Practice, Cengage Learning.

2. A. C. Holub. Compiler Design in C , Prentice-Hall Inc., 1993.

3. Raghavan, Compiler Design, TMH Publication.

4. Louden. Compiler Construction: Principles and Practice, Cengage Learning

List of Practicals:

1. Write a program in C/C++to check whether a string belongs to the grammar or not.
2. Write a program in C/C++to identify whether a given string is an identifier or not.
3. Write a program in C/C++ to check whether a given string is a keyword or not.
4. Write a program in C/C++ to implement the token separation operation.
5. Write a program in C/C++ to compute FIRST of non-terminals.
6. Write a program in C/C++ to compute FOLLOW(A).
7. Write a program to implement the Lexical analysis using C.
8. Write a program in C/C++ to implement recursive descendent parsing.
9. Write a program in C/C++ to calculate LEADING of non terminals.
10. Write a program in C/C++ to implement the Symbol table operation.
11. Write a program in C/C++ to implement operator precedence parsing.

Subject Name	L	T	P	Credit
Computer Architecture and Organization	2	1	2	4

Objectives:

This course gives an introduction to Computer organization and advance architectures. It will serve the purpose of
- Students to be familiarize the basic principles of computer architecture
- Expose different ways of communicating with I/O devices and standard I/O interfaces.
- Describe hierarchical memory systems including cache memories and virtual memory.
- Understand basic processing unit and organization of simple processor, concept of pipelining and other large computing systems.

Unit-1

Basic Structure of Computer : Structure of Desktop Computers, CPU: General Register Organization- Memory Register, Instruction Register, Control Word, Stack Organization, Instruction Format, ALU, I/O System,bus,CPU and Memory Program Counter, Bus Structure, Register Transfer Language- Bus and Memory Transfer, addressing modes.

Unit-2

Control Unit Organization:
Basic Concept of Instruction, Instruction Types, Micro Instruction Formats, Fetch and Execution cycle, Hardwired control unit, Micro-programmed Control unit- microprogram sequencer Control Memory, Sequencing and Execution of Micro Instruction. Computer Arithmetic: Addition and Subtraction, Tools Compliment Representation, Signed Addition and Subtraction, Multiplication and division, Booths Algorithm, Division Operation, Floating Point Arithmetic Operation.design of Arithmetic unit

Unit -3

Instruction set architecture, CISC Scalar Processors , RISC Scalar Processors, Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, pipeline hazards, Dynamic instruction scheduling – score boarding and Tomosulo's algorithm, Branch handling techniques, Arithmetic Pipeline Design, Static arithmetic pipeline, Multifunctional arithmetic pipelines.

Unit -4

Flynn's Classification, System Attributes to Performance, Parallel computer models Multiprocessors and multicomputer, Multivector and SIMD Computers. Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Control flow, data flow and Demand driven mechanisms. Static interconnection networks, Dynamic interconnection Networks: Bus Systems, Crossbar Switch, Multistage and Combining Networks.

Unit-5

Main memory- RAM, ROM, Secondary Memory – Magnetic Tape,Disk, Optical Storage, Cache Memory: Cache Structure and Design, Mapping Scheme, Replacement Algorithm, Improving Cache Performance, Virtual Memory,memory management hardware,Cache coherence, Snoopy protocols, Directory based protocols, distributed memory model and shared memory model

Outcomes:

- Analyse and design arithmetic and logical units.
- Apply the knowledge gained in the design of Computer.
- Design and evaluate performance of memory systems
- Learn the concepts of parallel processing, pipelining and interprocessor communication.

Text books:

1. Morris Mano , "Computer System Organization " PHI
2. C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization", McGraw-Hill, 2002
3. Kai Hwang, "Advanced computer architecture", TMH. 2013 - 14

Reference books:

1. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson, 2015.
2. Kain, Advance Computer Architecture: - A System Design Approach", PHI Learning

Subject Name	L	T	P	Credit
Information Storage and Management	3	0	0	3

Objectives:

 After successful completion of the course, the students should be able to,
• Evaluate storage architectures, including storage subsystems, DAS, SAN, NAS, CAS
• Define backup, recovery, disaster recovery, business continuity, and replication
• Understand logical and physical components of a storage infrastructure
• Identify components of managing and monitoring the data center
• Define information security and identify different storage virtualization technologies

Unit-1

Introduction to Storage Technology: Data proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information Lifecycle Management, Data categorization.

Unit-2

Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

Unit -3

Introduction to Networked Storage: JBOD, DAS, NAS, SAN & CAS evolution and comparison. Applications, Elements, connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN.

Unit -4

Hybrid Storage solutions; Virtualization: Memory, network, server, storage & appliances. Data center concepts & requirements, Backup & Disaster Recovery: Principles Managing & Monitoring: Industry management standards (SNMP, SMI-S, CIM), standard framework applications, Key management metrics (Thresholds, availability, capacity, security, performance).

Unit-5

Information storage on cloud :Concept of Cloud, Cloud Computing, storage on Cloud, Cloud Vocabulary, Architectural Framework, Cloud benefits, Cloud computing Evolution, Applications & services on cloud, Cloud service providers and Models, Essential characteristics of cloud computing, Cloud Security and integration.

Outcomes:

• Ability to identify key challenges in managing information and analyze different storage networking technologies and virtualization.
• Ability to understand components and the implementation of NAS.
• To understand types of archives and forms of virtualization
• To monitor the storage infrastructure and management activities.

Text books:

1. Information Storage and Management, Second Edition, EMC Education Services, Wiley India Edition, ISBN: 9788126537501.

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Reference books:

1. Storage Networks Explained, Ulf Tropan, Rainer Erkens, Wofgang Muller, Wiley, ISBN: 9788126518326 Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
2. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill

Subject Name	L	T	P	Credit
Network Security and Cryptography	3	0	0	3

Objectives:

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

Unit-1

Network Security, Attacks on network security, passive and active attacks, Cyber Attacks. Introduction to Number Theory: Divisibility theory in integers. Groups, GCD (Euclids Algorithm),Rings, Fields-Modular arithmetic-Euclid"s algorithm -Finite fields- Polynomial Arithmetic –Prime numbers-Fermat"s and Euler"s theorem -Testing for primality, The Chinese remainder theorem, Discrete logarithms.

Unit-2

Conventional Encryption , Classical Techniques -substitution and transposition ciphers, study of basic cryptanalysis possible on classical ciphers, Modern Techniques-block and stream ciphers, Block cipher Design Principles, Feistel structure, Shannon's principles of diffusion and confusion, Steganography, Encryption algorithms -Data Encryption Standard-Block cipher principles

Unit -3

Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm, Asymmetric cryptography: Public Key Encryption, The RSA algorithm, its strengths, possible cryptanalysis attacks possible on RSA such as timing attacks and CCA, Diffie –Hellman Key Exchange algorithm, Introduction to cryptographic hash algorithms.

Unit -4

Message Authentication: Authentication Requirements, Authentication Functions, Message Authentication Codes, Digital Signatures and Authentication Protocols, The Needham-Schroeder Protocol ,Kerberos , Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC, Digital Signature Standard (DSS), Key distribution and Management using symmetric and asymmetric encryption, X. 509 certificates.

Unit-5

E-mail Security: Security Services for E-mail-attacks possible through E-mail ,Electronic Mail Security PGP and S/MIME, IP Security, IP security Overview, IP Security Architecture, Authentication Header (AH), Encapsulating Security Payload (ESP).Firewalls-Firewall Design Principles, Trusted SystemsViruses, Worms, and other Malware -Virus and Worm Features ,Internet Scanning Worms ,Mobile Malware and Botnets.Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication- PKI as deployed by SSLAttacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET).

Outcomes:

- Evaluate security mechanisms using rigorous approaches, including theoretical.
- Identify the security issues in the network and resolve it.
- Analyze the vulnerabilities in any computing system and hence be able to design a security solution.

Text books:

1. Cryptography and Network Security- Atul Kahate,McGraw Hill
2. Cryptography and Network Security, Principles and Practice" -William Stallings, Pearson

Reference books:

1. Cryptography Theory and Practice, Third Edition, by Douglas Stinson
2. Network Security, Charlie Kaufman, Radia Perlman, Mike Speciner, Prentice Hall of india ,2002.

Subject Name	L	T	P	Credit
Software Engineering	2	1	2	4

Objectives:

To understand the basic concepts of software engineering, life cycle models and project management concepts. To understand in detail about the requirement analysis and requirement engineering processes.

Unit-1

Software process and project management: Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – Software Project Management: Estimation – LOC and FP Based Estimation, COCOMO Model – Project Scheduling – Scheduling, Earned Value Analysis - Risk Management.

Unit-2

Requirements analysis and specification : Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

Unit -3

Software Design

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design – Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

Unit -4

Testing and implementation:
Software testing fundamentals -Internal and external views of Testing-white box testing-basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging – Software Implementation Techniques: Coding practices-Refactoring.

Unit-5

Project management
Estimation – FP Based, LOC Based, Make/Buy Decision, COCOMO II - Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection, RMMM - Scheduling and Tracking –Relationship between people and effort, Task Set & Network, Scheduling, EVA – Process and Project Metrics.

Outcomes:

- Understanding the key dimensions of the challenge of Cloud Computing
- Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures.
- To analyze the case studies to derive the best practice model to apply when developing and deploying cloud based applications.
- Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application
- Development of cloud based applications using various cloud based platforms, Amazon Web service, Google App Engine, Microsoft Azure etc.

Text books:

1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, Mc Graw-Hill International Edition, 2010.

Reference books:

1. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.
2. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Private Limited ,2009.
3. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
4. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.
5. Stephen R. Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited, 2007.

Practical: - Lab work should include a running case study problem for which different deliverables at the end of each phase of a software development life cycle are to be developed. This will include modeling the requirements, architecture and detailed design. Subsequently the design models will be coded and tested.