CLOUD COMPUTING

Session: September 2022- January 2023

# Course Number and Name:

CSE 4085, Cloud Computing

# Credits and Course formats:

4, 3 classes/ Week, 1 hr/ Class;

1 PS Class of 2hrs/ Week

# Target Students:

Programme: B. Tech. (7th Semester) Branch: CSE

# Text Book and References: Text book

* Cloud Computing: Concepts, Technology & Architecture, 1e by ErI,Pearson India

# Specific Course Information:

1. **Course Description:**

This subject provides students with an in-depth study of cloud computing technologies and their use in business.  It looks into various standards based cloud systems and architectures. It further discusses various cloud delivery models, planning for migration to a cloud model. It also discusses governance and security issues in a cloud model and managing the cloud infrastructure.

Prerequisites and/or Co-requisites:

# Specific Goals for the Course:

At the end of the semester the students will able

* be able to compare and evaluate the ability of different cloud computing architectures to meet a set of given business requirements;
* be able to evaluate a set of business requirements to determine suitability for a cloud computing delivery model;
* be able to identify and design an ICT Risk Management strategy for a cloud computing delivery plan to meet business requirements;
* be able to critically analyse business requirements to plan a migration to a cloud model;
* be able to compare and critique Service Level Agreements (SLA) that meet the business requirements for a cloud computing plan

# Brief List of Topics to be Covered:

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| **Week 1** |  |
| Lecture 1 | Fundamentals of Cloud Computing : Introduction to Cloud Computing, Definition of Cloud Computing |
| Lecture 2 | Understanding Cloud Computing |
| Lecture 3 | Characteristics of Cloud Computing, Components of Cloud Computing |
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| **Week 2** |  |
| Lecture 4 | Advantages and Disadvantages of cloud computing |
| Lecture 5 | Vendor locked in problem |
| Lecture 6 | Fundamental Concepts and Models: Cloud delivery and cloud deployment models |
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| **Week 3** |  |
| Lecture 7 | Cloud Architectures: Infrastructure-as-a-Service (IaaS);Platform-as-a-Service (PaaS) |
| Lecture 8 | Software-as-a-Service (SaaS); Comparing Cloud Delivery Models |
| Lecture 9 | Combining Cloud Delivery Models: IaaS + PaaS ; IaaSa + PaaS + SaaS |

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| **Week 4** |  |
| Lecture 10 | Cloud Deployment Models: Public cloud; Private cloud |
| Lecture 11 | Hybrid cloud ; Community cloud |
| Lecture 12 | Other Cloud Deployment Models: Virtual Private Cloud; Inter-Cloud |
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| **Week 5** |  |
| Lecture 13 | Cloud-Enabling Technology:  • Broadband Networks and Internet Architecture  • Data Center Technology  • Virtualization Technology  • Web Technology  • Multitenant Technology  • Containerization |
| Lecture 14 | Broadband Networks and Internet Architecture: Internet Service Providers (ISPs), Internet Service Providers (ISPs), Router-Based Interconnectivity, Connection oriented interconnectivity. |
| Lecture 15 | Data Center Technology: Virtualization, Standardization and Modularity, Automation, Remote Operation and Management, High Availability, Security-Aware Design, Operation, and Management, Computing Hardware, Storage Hardware, LAN Fabric, SAN Fabric. |
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| **Week 6** |  |
| Lecture 16 | Virtualization Technology: Hardware Independence, Server Consolidation, Resource Replication, Operating System-Based Virtualization, Hardware-Based Virtualization, Virtualization Management, Other Considerations |
| Lecture 17 | Web Technology: Basic Web Technology, Web Applications, Multitenant Technology, Multitenancy vs. Virtualization, |
| Lecture 18 | Containerization: Containerization Vs. Virtualization, Benefits of Containers, Container Hosting and Pods, Fundamental Container Architecture Elements |
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| **Week 7** |  |
| Lecture 19 | Fundamental Cloud Security:  Basic Terms and Concepts:  Confidentiality,Integrity,Authenticity;Availability;Threat;Vulnerability;Risk;Security Controls; Security Mechanisms; Security Policies |
| Lecture 20 | Threat Agents:  Anonymous Attacker  Malicious Service Agent  Trusted Attacker  Malicious Insider |
| Lecture 21 | Cloud Security Threats:  Traffic Eavesdropping  Malicious Intermediary  Denial of Service  Insufficient Authorization  Virtualization Attack  Overlapping Trust Boundaries  Container Attack |
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| **Week 8** |  |
| Lecture 22 | Additional Considerations:  Flawed Implementations  Security Policy Disparity  Contracts  Risk Management  Case Study Example |
| Lecture 23 | Cloud Infrastructure Mechanisms:  Logical Network Perimeter  Virtual Server  Cloud Storage Device  Cloud Usage Monitor  Resource Replication  Ready-Made Environment  Container |
| Lecture 24 | Logical Network Perimeter: Virtual Firewall, Virtual Network |
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| **Week 9** |  |
| Lecture 25 | Virtual Server; Cloud Storage Device |
| Lecture 26 | Cloud Usage Monitor |
| Lecture 27 | Resource Replication |
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| **Week 10** |  |
| Lecture 28 | Ready-Made Environment |
| Lecture 29 | Container |

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| Lecture 30 | Specialized Cloud Mechanisms:  • Load Balancer  • SLA Monitor  • Pay-Per-Use Monitor  • Audit Monitor  • Failover System  • Hypervisor  • Resource Cluster  • Multi-Device Broker  • State Management Database |
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| **Week 11** |  |
| Lecture 31 | Load Balancer; SLA Monitor |
| Lecture 32 | Pay-Per-Use Monitor; Audit Monitor |
| Lecture 33 | Failover System; Hypervisor |
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| **Week 12** |  |
| Lecture 34 | Resource Cluster; Multi-Device Broker |
| Lecture 35 | State Management Database |
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1. **Evaluation Scheme (under GP1):**

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| Assignments: | 20% |
| Attendance: | 5% |
| Mid-Semester: | 15% |
| End-Semester(Theory): | 60% |