

## Syllabus

Introduction - Overview of Computing Paradigms: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing Cloud Computing (NIST Model) Properties and Characteristics of Cloud.

Cloud Computing Architecture - Cloud computing stack Service Models (XaaS): Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS) Deployment Models: Public cloud, Private cloud, Hybrid cloud. Data Center Architecture.

Cloud Resource Virtualization - Introduction to virtualization Different approaches to virtualization Hypervisors Machine Image Virtual Machine (VM) Process VM vs System VM Resource Virtualization: Server, Storage, Network Full Virtualization vs Para Virtualization Operating System Support for Virtualization Virtual Machine (resource) Provisioning and Manageability VM Placement, VM Migration.

Service Management in Cloud Computing - Service Level Agreements (SLAs) Billing & Accounting Economics of scaling Managing Data: Database & Data Stores in Cloud, Large Scale Data Processing.

Task Scheduling in Cloud - Scheduling Algorithms for Computing Clouds Fair Queuing Start Time Fair Queuing Borrowed Virtual Time Cloud Scheduling Subject to Deadlines Scheduling MapReduce Applications Subject to Deadlines.

Cloud Security - Cloud Security Risks, Trust, Operating System Security, VM Security, Security of Virtualization, Security Risks Posted by Shared Images, Security Risks Posted by Management OS, Data privacy and security Issues, Identity & Access Management, Access Control, Authentication in cloud computing.

Case Study - Microsoft Azure, Amazon EC2

## Course Objectives

1. To understand Cloud Computing concepts, technologies, architecture and applications
2. To understand the underlying principle of cloud virtualization, cloud storage, data management and data visualization
3. To understand different cloud programming platforms and tools to develop and deploy applications on cloud

## Course Outcomes

Upon successful completion of this course students should be able to:

1. Develop and deploy cloud application using popular cloud platforms
2. Design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud and building private cloud.
3. Make recommendations on cloud computing solutions for an enterprise.

## Text Book:

1. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, *Cloud Computing: Principles and Paradigms*, Wiley

## Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, *Mastering Cloud Computing*, McGraw Hill
2. Sandeep Bhowmik, *Cloud Computing*, Cambridge Press
3. Prasant Kumar Pattnaik, Manas Ranjan Kabat & Souvik Pal, *FUNDAMENTALS OF CLOUD COMPUTING*, Vikas Publishing