Paper Code – CSM401(01) **Paper Name – Cloud Computing (Elective-I)**		**Full Marks: 100**
Module	**Topics**	**Lecture Hours**
Module-1: **Introduction to Cloud Computing**	Cloud computing at a glance – The vision of cloud computing, Definition of cloud computing, The cloud computing reference model, Characteristics and benefits of cloud computing. Evolution of cloud computing – parallel computing, distributed computing, cluster computing, grid computing, virtualization, Web 2.0, Client/Server computing, P2P computing, service-oriented computing and utility-oriented computing. Business driver for adopting cloud computing. Cloud Service Models – IaaS, PaaS, SaaS, XaaS. Cloud Deployment Models – Private, Public, Hybrid, Community, Cloud Federation.	5
Module-2: **Virtualization Technologies**	Introduction to virtualization. Characteristics of virtualized environment – Security, Managed execution, Portability. Types of Virtualization – Bare Metal and Hosted. Hardware level virtualization – Machine(x86) reference model, Hypervisor, Hardware assisted virtualization, Full virtualization, Paravirtualization. Operating system level virtualization. Other types of virtualization – storage virtualization, Network virtualization, Desktop virtualization. VM Migration techniques. Pros and cons of virtualization. Case studies – Xen, VMware and Microsoft Hyper-V.	10
Module-3: **Cloud Services and Platforms**	Compute service – Amazon EC2, Google Compute Engine, Windows Azure VM. Storage Services – Amazon S3, Google Cloud Storage, Windows Azure Storage. Database Services – Amazon RDS, Amazon SimpleDB and DynamoDB, Google Coud SQL, Google Cloud Datastore, Windows Azure SQL Database and Table Service. Application Services – Amazon SQS, Amazon SNS, Email service. Content Delivery Services – Amazon CludFrnt, Windows Azure Content Delivery Network. Analytics Services – Amazon EMR, Google BigQuery, Windows Azure HDInsight. Deployment and Management Services – Amazon Elastic Beanstalk, Amazon CloudFormation. Open Source Cloud Platform – CloudStack, Eucalyptus, OpenStack.	10
Module-4: **Management of Cloud Resources**	Lifecycle management of cloud applications. Monitoring cloud resources – Zabix, Amazon CloudWatch. Feedback control based on dynamic thresholds, Bag-of-Task (BoT) scheduling problems, VM Placement problems, Resource bundling, combinatorial auctions, fair queuing, borrowed virtual time, Cloud scheduling subject to deadlines, Cost and Energy Efficient Scheduling algorithms, Scheduling in Federated environment. Identity and Access management for Cloud Resources – Amazon Identity and Access Management Services, Windows Azure Active Directory.	15

Text Books:

1. Mastering Cloud Computing - Foundations and Applications Programming by Christian Vecchiola, Rajkumar Buyya, and S. Thamarai Selvi, Elsevier, 2013.
2. Cloud Computing – A Hands-on Approach by Arshdeep Bahga and Vijay Madasetti, Universities Press, 2014.

Reference Books:

1. Cloud Computing Bible by Barrie Sosinsky, Wiley-India, 2010.
2. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2014.
3. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012.
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing by Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010.