**Elective III: Clustering & Cloud Computing**

**Unit I:** Introduction to Cloud Computing: Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Properties, Characteristics & Disadvantages of Cloud Computing, Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing. Legal issues when using cloud models, challenges in cloud computing, Overview of Mobile Cloud.

**Unit II:** Cloud Computing Architecture: Cloud computing stack, Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services, Service Models (XaaS), Infrastructure as a Service (IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), Virtualization Technology: Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization, Infrastructure as a Service (Iaas)using OpenStack/OwnCloud.

**Unit III:** Big Data Analysis, Hadoop and Map Reduce: Introduction, Clustering Big Data, Classification of Big Data, Hadoop MapReduce Job Execution, Hadoop scheduling, Hadoop cluster setup, configuration of Hadoop, starting and stopping Hadoop cluster.

**Unit IV:** Security in Cloud: Cloud Security Challenges, Infrastructure Security, Network level security, Host level security, Application level security, data privacy, data security, application security, virtual machine security, Identity Access Management, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations.

**Unit V:** Application Development using C#: Understand object oriented concepts in C#.NET, Creation of UI and event handling, web page creation using ASP.NET, ADO.NET architecture, implementation of data seta, using ADO.NET in console application, using ADO.NET in web application. 36

**Unit VI:** Creating Cloud Application using Azure: Creating simple cloud application, configuring an application, creating virtual machine, deployment of application to Windows Azure Cloud, using Azure Storage Services, using Azure Table Service, deployment of application to the production environment.

**Text Books:** 1. Google Compute Engine, Mark Cohen and K. Hurley, O’Reilly, 2014.

2. Cloud Computing: Principles and Paradigms, Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011

 3. Cloud Computing, A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2014.

 4. Microsoft Azure: Enterprise Application Development, R. J. Dudley and N. A. Duchene, SPD Publication.

**Reference Books:** 1. Cloud Computing using Windows Azure, B. M. Harwani, SPD Publication.

2. Cloud Computing, Implementation, Management and Security, J. W. Rittinghouse and J. F. Ransome, CRC Press.