With effect from the A.Y 2019-20

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SYLLABUS FOR B.E VII SEMESTER

DISTRIBUTED & CLOUD COMPUTING

Instructions : 3 Hrs / Week	SEE Marks : 70	Course Code: PC710CS
Credits : 3	CIE Marks : 30	Duration of SEE: 3 Hours
Instructor's	MSV Sashi Kumar	Garima Jain

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, students will be able to
● Explain distributed system and cloud models ● Apply distributed computational model and understand the need for cloud computing.	1. Design service and deployment models that enable Distributed computation over Cloud 2. Analyze the need for virtualization in a cloud environment and learn to apply it across compute memory and storage levels 3. Develop distributed computation model over large datasets using parallel and distributed programming approaches over cloud platforms. 4. Analyze the security issues across SPI infrastructure and evaluate the role of IAM and Privacy in cloud 5. Extend the Cloud enabling technologies for Internet of Things, Professional & Social Media

UNIT I

Distributed System Models & Enabling technology: Scalable computing over the internet, Technologies for network based system, System models for distributed & cloud, Software environments for distributed & Cloud.

Time and Global States: Introduction, Clocks events and process states, synchronizing physical clocks, Logical clocks, Global states

Introduction to Cloud Computing: Cloud Computing in a Nutshell System Model for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles, of Cloud Computing, Challenges and Risks, Service Models

UNIT II

Virtual Machines and Virtualization of Cluster and Data Centres: Levels of Virtualization, Virtualization structures/Tools and Mechanism, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resources Management, Virtualization Data-Centre Automation

UNIT III

Service Oriented Architecture for Distributed Computing: Services & SOA, Message Oriented Middleware, Workflow in SOA.

Cloud Programming & Software Environments: Features of Cloud & Grid, Parallel & Distributed programming paradigms, Programming support of Google Cloud, Amazon AWS & Azure.
Case Studies; OpenStack& Aneka

UNIT IV

Cloud Security, Data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud CryptDb: Onion Encryption layers- DET, RND, OPE, JOIN, SEARCH, HOM, and Homomorphism Encryption, FPE.

UNIT V
Trust Management& Green Cloud
Trust, Reputation and Security Management in P2P Systems, Load Balancing-HAProxy, Container based Virtualization-Docker, Green Cloud - Energy Consumption Models and Energy-aware Data Centers and Clouds

Suggested Book:

1. Kai Hwang. Geoffrey C. Fox, Jack J. Dongarra, *"Distributed and Cloud Computing from parallel processing to the internet of things",* Elsevier, 2012.

Reference Books:

1. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, "*Cloud Computing: principles and paradigms* (Wiley Series on Parallel and Distributed Computing), Wiley Publishing (c) 2011.
2. Raluca Ada Popa, Catherine M.S. Redfiled, NickolaiZeldovich, and Hari Balakrishnan, "*Crypt DB" Protecting confidentiality with encrypted Query Processing"* 23rd ACM Symposium on Operating Systems principles (SOSP 2011), Cascais, Portugal October 2011.
3. Craig Gentry,*A fully Homomorhic Encryption Scheme*, Doctoral Dissertation, September 2009
4. Ajay D. Kshemkalyani and Mukesh Singhal,*Distributed Computing: Principles, Algorithms, and Systems*, Cambridge, 2008

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs45/
2. https://cloud.google.com/load-balancing/docs/
3. https://docs.microsoft.com/en-us/azure/load-balancer/load-balancer-overview
4. https://www.docker.com/resources/what-container
5. http://www.haproxy.org/

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SYLLABUS FOR B.E VII SEMESTER

DISTRIBUTED & CLOUD COMPUTING LAB

Instruction : 2 Hrs / Week	SEE Marks : 50	Course Code: **PE 711CS**
Credits : 1	CIE Marks : 25	Duration of SEE : 3 Hrs
Instructor's	MSV Sashi Kumar	M Shanmugha Sundari

Course Objectives	Course Outcomes
Students should be able to	At the end of the course, students will be able to
• Implement distributed transactions • Install, configure and deploy applications using various cloud platforms	1. Implement a distributed transaction model 2. Launch and run a highly available web application on Amazon cloud platform 3. Deploy and develop scalable compute model using Distributed Storage 4. Develop full stack application using Google cloud 5. Develop a end to end application over a Cloud environment

Programming Exercise:

1. Implement a 2PC for distributed transaction management.
2. Design a Web service using Simple Object Access Protocol (SOAP)
3. Hosting a static website on Amazon AWS
4. Deploying a Node.js Web Application on AWS
5. Installation and configuration of Hadoop using Docker Container
6. Implement a distributed application on Hadoop framework to count word frequency with Map Reduce
7. Analyzing Big Data using Hadoop
8. Use native MySQL connections from Google App Engine to Google Cloud SQL
9. AngularJS CRUD application for Google App Engine
10. Final Project to develop a case study on Cloud

Suggested Book:

1. Kai Hwag. Geoffrey C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing from parallel processing to the internet of things", Elsevier, 2012.

Reference Books:

1. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, “Cloud Computing: principles and paradigms (Wiley Series on Parallel and Distributed Computing), Wiley Publishing (c) 2011.
2. Raluca Ada Popa, Catherine M.S. Redfiled, NickolaiZeldovich, and Hari Balakrishnan, “crypt DB” Protecting confidentiality with encrypted Query Processing” 23rdACM Symposium on Operating Systems principles (SOSP 2011), Cascais, Portugal October 2011.
3. Craig Gentry,A fully Homomorhic Encryption Scheme, Doctoral Dissertation, September 2009
4. Ajay D. Kshemkalyani and Mukesh Singhal, Distributed Computing: Principles, Algorithms, and Systems, Cambridge, 2008

Online Resources:

1. https://aws.amazon.com/getting-started/projects/
2. https://onlinecourses.nptel.ac.in/noc18_cs45/
3. https://cloud.google.com/load-balancing/docs/
4. https://docs.microsoft.com/en-us/azure/load-balancer/load-balancer-overview
5. https://www.docker.com/resources/what-container