

Savitribai Phule Pune University Third Year of Computer Engineering (2019 Course) Elective II 310254(C): Cloud Computing		
Teaching Scheme: Theory: 04 Hours/Week	Credit: 03	Examination Scheme: Mid-Semester (TH) : 30 Marks End-Sem (TH): 70 Marks
Prerequisites Courses: Computer Networks and Security(310244), Distributed Systems (310245C)		
Companion Course: Laboratory Practice II (310258)		
Course Objectives: <ul style="list-style-type: none"> To study fundamental concepts of cloud computing To learn various data storage methods on cloud To understand the implementation of Virtualization in Cloud Computing To learn the application and security on cloud computing To study risk management in cloud computing To understand the advanced technologies in cloud computing 		
Course Outcomes: On completion of the course, learners should be able to CO1: Understand the different Cloud Computing environment CO2: Use appropriate data storage technique on Cloud, based on Cloud application CO3: Analyze virtualization technology and install virtualization software CO4: Develop and deploy applications on Cloud CO5: Apply security in cloud applications CO6: Use advance techniques in Cloud Computing		
Course Contents		
Unit I	Introduction to Cloud Computing	07 Hours
Importance of Cloud Computing, Characteristics, Pros and Cons of Cloud Computing, Migrating into the Cloud, Seven-step model of migration into a Cloud, Trends in Computing. Cloud Service Models: SaaS, PaaS, IaaS, Storage. Cloud Architecture: Cloud Computing Logical Architecture, Developing Holistic Cloud Computing Reference Model, Cloud System Architecture, Cloud Deployment Models.		
#Exemplar/Case Studies	Cloud Computing Model of IBM	
*Mapping of Course Outcomes for Unit I	CO1	
Unit II	Data Storage and Cloud Computing	07 Hours
Data Storage: Introduction to Enterprise Data Storage, Direct Attached Storage, Storage Area Network, Network Attached Storage, Data Storage Management, File System, Cloud Data Stores, Using Grids for Data Storage. Cloud Storage: Data Management, Provisioning Cloud storage, Data Intensive Technologies for Cloud Computing. Cloud Storage from LANs to WANs: Cloud Characteristics, Distributed Data Storage.		
#Exemplar/Case Studies	Online Book Marketing Service, Online Photo Editing Service	

*Mapping of Course Outcomes for Unit II		CO2
Unit III	Virtualization in Cloud Computing	07 Hours
Introduction: Definition of Virtualization, Adopting Virtualization, Types of Virtualization, Virtualization Architecture and Software, Virtual Clustering, Virtualization Application, Pitfalls of Virtualization. Grid, Cloud and Virtualization: Virtualization in Grid, Virtualization in Cloud, Virtualization and Cloud Security. Virtualization and Cloud Computing: Anatomy of Cloud Infrastructure, Virtual infrastructures, CPU Virtualization, Network and Storage Virtualization.		
#Exemplar/Case Studies	Xen: Para virtualization, VMware: Full Virtualization, Microsoft Hyper-V	
*Mapping of Course Outcomes for Unit III		CO3
Unit IV	Cloud Platforms and Cloud Applications	07 Hours
Amazon Web Services (AWS): Amazon Web Services and Components, Amazon Simple DB, Elastic Cloud Computing (EC2), Amazon Storage System, Amazon Database services (Dynamo DB). Microsoft Cloud Services: Azure core concepts, SQL Azure, Windows Azure Platform Appliance. Cloud Computing Applications: Healthcare: ECG Analysis in the Cloud, Biology: Protein Structure Prediction, Geosciences: Satellite Image Processing, Business and Consumer Applications: CRM and ERP, Social Networking, Google Cloud Application: Google App Engine. Overview of OpenStack architecture.		
#Exemplar/Case Studies	Multiplayer Online Gaming	
*Mapping of Course Outcomes for Unit IV		CO4
Unit V	Security in Cloud Computing	07 Hours
Risks in Cloud Computing: Risk Management, Enterprise-Wide Risk Management, Types of Risks in Cloud Computing. Data Security in Cloud: Security Issues, Challenges, advantages, Disadvantages, Cloud Digital persona and Data security, Content Level Security. Cloud Security Services: Confidentiality, Integrity and Availability, Security Authorization Challenges in the Cloud, Secure Cloud Software Requirements, Secure Cloud Software Testing.		
#Exemplar/Case Studies	Cloud Security Tool: Acunetix.	
*Mapping of Course Outcomes for Unit V		CO5
Unit VI	Advanced Techniques in Cloud Computing	07 Hours
Future Trends in cloud Computing, Mobile Cloud, Automatic Cloud Computing: Comet Cloud. Multimedia Cloud: IPTV, Energy Aware Cloud Computing, Jungle Computing, Distributed Cloud Computing Vs Edge Computing, Containers, Docker, and Kubernetes, Introduction to DevOps. IOT and Cloud Convergence: The Cloud and IoT in your Home, The IOT and cloud in your Automobile, PERSONAL: IoT in Healthcare.		
#Exemplar/Case Studies	Case studies on Dev Ops: DocuSign, Forter, Gengo.	
*Mapping of Course Outcomes for Unit VI		CO6

Learning Resources**Text Books :**

1. A. Srinivasan, J. Suresh, "Cloud Computing: A Practical Approach for Learning and Implementation", Pearson, ISBN: 978-81-317-7651-3
2. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, ISBN-13:978-1-25-902995-0

Reference Books :

1. James Bond, "The Enterprise Cloud", O'Reilly Media, Inc. ISBN: 9781491907627
2. Dr. Kris Jamsa, "Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more", Wiley Publications, ISBN: 978-0-470-97389-9
3. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", 2010, The McGraw-Hill.
4. Gautam Shrof, "ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications", Cambridge University Press, ISBN: 9780511778476
5. Tim Mather, Subra K, Shahid L., "Cloud Security and Privacy", Oreilly, ISBN-13 978-81-8404-815-5
6. Dr. Kumar Saurabh, "Cloud Computing, 4ed: Architecting Next-Gen Transformation Paradigms", Wiley publication, ISBN: 9788126570966
7. Rishabh Sharma, "Cloud Computing: Fundamentals, Industry Approach and Trends", Wiley publication, ISBN:

e-Books :

- <https://sjceodisha.in/wp-content/uploads/2019/09/CLOUD-COMPUTING-Principles-and-Paradigms.pdf>
- <https://studytm.files.wordpress.com/2014/03/hand-book-of-cloud-computing.pdf>
- <https://arpitapatel.files.wordpress.com/2014/10/cloud-computing-bible1.pdf>
- <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.500-291r2.pdf>

MOOCs Courses link:

- Cloud Computing https://onlinecourses.nptel.ac.in/noc21_cs14/preview?
- Cloud Computing and Distributed System: https://onlinecourses.nptel.ac.in/noc21_cs15/preview?
- <https://www.digimat.in/nptel/courses/video/106105167/L01.html>
- <https://www.digimat.in/nptel/courses/video/106105167/L03.html>
- <https://www.digimat.in/nptel/courses/video/106105167/L20.html>

@ The CO-PO Mapping Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	-	-	-	-	-	-	-	-	1
CO2	1	2	1	-	-	-	-	-	-	-	-	-
CO3	1	2	1	-	2	-	-	-	-	-	-	-
CO4	1	2	2	1	-	-	-	-	-	-	-	1
CO5	1	2	2	2	-	-	-	-	-	-	-	-
CO6	1	2	2	1	1	-	-	-	-	-	-	1