Course Handout

Semester: VII   **Academic Year:** 2019-20

Course Code: CS4221   **Course Title:** Cloud services & technologies

LTPC: 3024   **Programme:** Bachelor of Technology

Course-in-charge: Nagendra Nyamgondalu

1.   Course Description

- Cloud technologies are seeing wide-spread adoption by business across all the domains .

- This course will provide a background on how owning & operating a data center has many pain points for businesses. With that context, it will provide clarity on why adopting the cloud eases these pain points.

- This course will also focus on adoption models, deployment models, virtualization, containerization, DevOps and automation.

- The course will then compare monolithic architecture VS microservices architecture, writing and deploying programs on the cloud, API management and the nuances across Google cloud platform, Amazon Web Services and Microsoft Azure.

- The pre-requisite for attending this course is knowledge of SDLC and programming in python.

2.   Course Content

Unit 1. Typical software project development timelines, data centres – scalability, high availability and disaster recovery. Cloud elasticity, deployment models and offering models. Lab: Introduction to the Google cloud platform and deploying a simple program using the App engine service

Unit 2. Virtualization & Containerization.. Introduction to DevOps, CI/CD. Lab: Containerize the simple program written in Unit1 and deploy on the Google Cloud platform using Docker & Kubernetes.

Unit 3. Monolithic Vs Microservices architecture, RESTful APIs, essential elements of DevOps, overview of pair programming. Lab: Write a micro-services architecture based program using REST APIs.

Unit 4. Automation strategy, automation tools, building an end-to-end DevOps pipeline. Lab: Use Jenkins, github and Pytest to create a deployment pipeline to deploy the program written in Unit3 on the Google cloud platform.

Unit 5. Big Query and data analytics on Google cloud platform. Lab: ingest data and build a dashboard

Unit 6. API management with Apigee, Infrastructure as code, introduction to puppet. Lab: APIs with Apigee.

Unit 7. Introduction to Microsoft Azure platform. Lab: Write and deploy a program on Azure

Unit 8. Introduction to Amazon Webservices. Lab: Write and deploy a program on AWS

3. **Course Outcomes:** After the completion of the course the student will be able to:

CO1	Understand the core value add of cloud platforms and why businesses are adopting the,
CO2	Develop proficiency in writing cloud native applications using microservices architecture
CO3	Understand the significance of DevOps and develop proficiency in automation and building a deployment pipeline
CO4	Learn the difference nuances of Google cloud platforms, Amazon Web services and Microsoft Azure
CO5	Understand REST APIs and the use of API management tools such as Apigee

4. **Course Outcomes Mapping with Programme Outcomes**

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15

5. **Session Plan**

Lecture No.	Topics	Course Outcome
1-5	Typical software project development timelines, data centres – scalability, high availability and disaster recovery. Cloud elasticity, deployment models and offering models.	CO1
6-8	Virtualization & Containerization.. Introduction to DevOps, CI/CD. How is DevOps being used and applied in the industry	CO3 & CO4
9-15	Monolithic Vs Microservices architecture, RESTful APIs, essential elements of DevOps, overview of pair programming.	CO2 & CO3
16-25	Automation strategy, automation tools, building an end-to-end DevOps pipeline	CO3 & CO4
26-30	Big Query and data analytics on Google cloud platform. Lab: ingest data and build a dashboard	CO4
31-35	API management with Apigee, Infrastructure as code, introduction to puppet. Lab: APIs with Apigee	CO5
36-45	Overview of Microsoft Azure and Amazon Web services.	CO4

6. **Evaluation Scheme**

Evaluation Components	Mode of Exam	Date & Day	Time	Weightage
Med Sem I	Online	As per academic calendar	1 h	20%
Med Sem II	Online	As per academic calendar	1 h	20%
Comprehensive/End Sem	Online	As per academic calendar	2 h	30%
Practical *	Comprehensive Practical exam & Viva	Before comprehensive exam	2 h	20%
Attendance		Throughout the course		10%

*Practical Exam will be evaluated based on Comprehensive Practical exam and Viva. Course Practical Evaluation Scheme is as follows:

Evaluation Components	Weightage (20%)
Comprehensive Practical Exam	10%
Viva Voce	10%

7. **Course Outcomes Mapping with Evaluation Components**

Course Outcomes	Mid-Sem I	Mid-Sem II	Comprehensive/ End Sem	Practical	Quiz

H- High**, M-** Moderate**, L-** Low and **NA-** Not applicable

8. **Attendance Policy**

As per Attendance policy of the University

9. **Make up Policy**

Students who are likely to miss a component of evaluation on a genuine reason may be given a make-up of that component by the CourseIn-Charge. The students are required to approach either of the CourseIn-Charge immediately for the same before the conduct of the evaluation component. It is the responsibility of the student to approach the CourseIn-Charge. The Course In-Charge will not allow makeup, if student approach 7 days after the Examination.

10. **Plagiarism**

We are committed to upholding standards of academic integrity and honesty. Plagiarism in any form is unacceptable and will be treated seriously.

11. **Grading Policy**

Marks obtained in all the components of Evaluation shall be totaled and the final marks shall be converted in the letter grades, namely, A, B, C, D, E and others as per

the university policy. The grading is relative and normally it is centered around the average of a class.

12. **Text Books**

Cloud Application Architectures: Building Applications and Infrastructure in the Cloud by George Reese (Theory in Practice (O'Reilly)) 1st Edition

Building Microservices: Designing Fine-Grained Systems by Sam Newman 1st Edition

Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation by Jez Humble and David Farley (Addison-Wesley Signature Series (Fowler)) 1st Edition

14. **Reference Books & resources**

The Docker Book: Containerization is the new virtualization by James Tunrbull

Online resources

1: https://wiki.jenkins.io/display/JENKINS/Use+Jenkins

2: https://cloud.google.com/docs/

3. https://docs.aws.amazon.com

4. https://azure.microsoft.com/en-us/developer/

15. **List of Practical/Experiments**

P1. Deploying a simple program using the App engine service on GCP.

P2. Containerize the simple program written in Unit1 and deploy on the Google Cloud platform using Docker & Kubernetes

P3. Write a micro-services architecture based program using REST APIs..

P4. Use Jenkins, github and Pytest to create a deployment pipeline to deploy the program written in Unit3 on the Google cloud platform.

P5. ingest data and build a dashboard on GCP Big Query

P6. Manage APIs with Apigee

P7. Write & deploy program on AWS

P8. Write and deploy program on Azure

16. **Consultation Hour**

All information regarding course will be posted on Moodle. Students are requested to check Moodle for any updates twice a day. The student may approach the Course-In-Charge (when in campus) else via WhatsApp/email, for any clarification or removal of their difficulties.