



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## COMPUTER SCIENCE AND ENGINEERING

### COURSE DESCRIPTION FORM

|                            |  |           |            |         |
|----------------------------|--|-----------|------------|---------|
| <b>Course Title</b>        | <b>CLOUD COMPUTING</b>                         |           |            |         |
| <b>Course Code</b>         | <b>A70519</b>                                  |           |            |         |
| <b>Regulation</b>          | <b>R15 - JNTUH</b>                             |           |            |         |
| <b>Course Structure</b>    | Lectures                                       | Tutorials | Practicals | Credits |
|                            | 4  | -         | -          | 4       |
| <b>Course Coordinator</b>  | Ms. Ch Sri Vidya, Assistant Professor, CSE     |           |            |         |
| <b>Team of Instructors</b> | Ms. S Swarajya Laxmi, Assistant Professor, CSE |           |            |         |
|                            | Ms. A Jayanthi, Assistant Professor, CSE       |           |            |         |
|                            | Mr. B Tejaswi, Assistant professor, CSE        |           |            |         |

#### I. COURSE OVERVIEW:

Cloud Computing is a large-scale distributed computing paradigm which has become a driving force for information technology over the past several years. The exponential growth data size in scientific instrumentation/simulation and social media has triggered the wider use of cloud computing services. We will explore solutions and learn design principles for building large network-based systems to support both compute and data intensive computing across geographically distributed infrastructure.

#### II. PREREQUISITE(S):-

| Level | Credits | Periods/ Week | Prerequisites   |
|-------|---------|---------------|---|
| UG    | 4       | 4             | Computer networks, Distributed systems, middleware technologies |

#### III. MARKS DISTRIBUTION:

| Sessional Marks  | University End Exam marks | Total Marks |
|--|---------------------------|-------------|
| <b>Midterm Test</b><br>There shall be 2 midterm examinations. Each midterm Examination consists of subjective type and Objective type tests.<br>The subjective test is for 10 marks, with duration of 1 hour. Subjective test of each semester shall contain 4 questions; the student has to answer 2 questions, each carrying 5 marks.<br>The objective type test is for 10 marks with duration of 20 minutes. It consists of 10 Multiple choice and 10 objective type questions, the student has to answer all the questions and each carries half mark.<br>First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining portion. | 75                        | 100         |

| Sessional Marks   | University End Exam marks | Total marks |
|---|---------------------------|-------------|
| Five marks are marked for assignments. There shall be two assignments in every theory course. Marks shall be awarded considering the average of two assignments in each course. |                           |             |

#### IV. EVALUATION SCHEME:

| S.No | Component            | Duration   | Marks |
|------|----------------------|------------|-------|
| 1.   | IMidExamination      | 80 minutes | 20    |
| 2.   | I Assignment         | -          | 5     |
| 3.   | II MidExamination    | 80 minutes | 20    |
| 4.   | II Assignment        | -          | 5     |
| 5.   | External Examination | 3 hours    | 75    |

#### V. COURSE OBJECTIVES:

**Upon successful completion of this course students will be able to:**

1. Understand fundamental concepts in the area of cloud computing
2. Determine knowledge in applications of cloud computing
3. Develop the broad perceptive of cloud architecture and model.
4. Understand the concept of virtualization and design of cloud services.
5. Understand the familiarity of the lead players in the cloud.
6. Understand the features of Cloud Simulator.
7. Develop different cloud programming model as per need.
8. Define and design the trusted cloud computing system.

#### VI. COURSE OUTCOMES:

**Upon successful completion of this course students will be able to:**

1. Define cloud computing and related concepts
2. Understand the key dimensions of the challenges of Cloud Computing
3. Understand the assessment of the economics, financial, and technological implications for selecting cloud computing for an organization
4. Describe the benefits of cloud computing
5. Understand the challenges of cloud computing
6. Understand how cloud components fit together
7. Determine the suitability of in-house v/s hosted solutions
8. Understanding the systems, protocols and mechanisms to support cloud computing
9. Develop applications for cloud computing
10. Understanding the hardware necessary for cloud computing
11. Determine numerous opportunities exist for practitioners seeking to create solutions for cloud computing.
12. Develop the best practices in migrating to the cloud is unique to every class of enterprise applications and unique to every corporate practice group.

## VII. HOW PROGRAM OUTCOMES ARE ASSESSED:

| Program Outcomes |  | Level | Proficiency assessed by |
|------------------|--|-------|-------------------------|
| PO1              | <b>Engineering Knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.  | S     | Assignment, Exercises   |
| PO2              | <b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.   | S     | Exercises               |
| PO3              | <b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. | H     | Exercises               |
| PO4              | <b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.  | N     | --                      |
| PO5              | <b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.   | N     | --                      |
| PO6              | <b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.   | N     | --                      |
| PO7              | <b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.   | N     | --                      |
| PO8              | <b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering  | S     | Seminars, Discussions   |
| PO9              | <b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.   | N     | --                      |
| PO10             | <b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear.      | N     | --                      |
| PO11             | <b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply Mini Projects these to one's own work, as a member and leader in a team, to manage Projects and in multidisciplinary environments                          | H     | Exercises, Discussions  |
| PO12             | <b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological   | N     | --                      |

**N - None**

**S - Supportive**

**H - Highly Related**

## VIII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

| Program Specific Outcomes |  | Level | Proficiency assessed by |
|---------------------------|--|-------|-------------------------|
| PSO1                      | <b>Professional Skills:</b> The ability to research, understand and implement computer programs in the areas related to algorithms, system software, Multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity. | H     | Lectures, Assignments   |
| PSO2                      | <b>Problem-Solving Skills:</b> The ability to apply standard practices and Strategies in software project development using open-ended programming environments to deliver a quality product for business success.   | S     | Projects                |
| PSO3                      | <b>Successful Career and Entrepreneurship:</b> The ability to employ Modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.   | H     | Guest Lectures          |

N - None

S - Supportive

H - Highly Related

## IX. SYLLABUS:

### UNIT – I

**System Modeling, Clustering And Virtualization:** Distributed system models and enabling technologies, computer clusters for scalable parallel computing, virtual machines and virtualization of clusters and data centers.

### UNIT – II

**Foundations:** Introduction to cloud computing, migrating into cloud, enriching the integration of service paradigm for cloud era, the enterprise cloud computing paradigm.

### UNIT – III

**Inter Process Communication: Infra Structure As Service (IAAS) & Platform And Software Service(PAAS/SAAS):** Virtual machine provisioning and migration services, on the management of virtual machines for cloud infrastructure, enhancing cloud computing environments using a cluster as service, secure distributed data storage in cloud computing.

Aneka, comet cloud, T-systems, work flow engine for clouds, understanding scientific applications for cloud environments.

### UNIT-IV

**Monitoring, Management And Applications :** An Architecture for federated cloud computing ,SLA management in cloud computing, performance prediction for HPC on clouds, best practices in Architecting cloud applications in the AWS cloud, building content delivery networks using clouds, resource cloud mashups.

### UNIT V

**Governance and case studies:** organizational readiness and change management in cloud age, data security in cloud, legal issues in cloud computing, achieving production readiness for cloud services.

### Text Books

1. Cloud computing: principles and paradigms by rajkumar buyya, James Broberg and Andrzej M.Goscinski,Wiley,2011.
2. Distributed and cloud computing , kai Hwang, Geofferyu C.fox, jack J.dongarra, Elsevier, 2012

## References

1. Cloud Computing :A practical approach, Anthony T.velte, Toby J.velte, Robert Isenpeter, Tata McGraw Hill,2011.
2. Enterprise Cloud Computing, Gautam Shroff, Cambridge University press,2010.
3. Cloud computing: implementation ,management and security, john W .Ritting house ,James F. Ransome ,CRC press,rp2012.
4. Cloud applications architectures: building Applications and infrastructure in the cloud,George Reese ,O reilly,SPD,rp2011.
5. Cloud security and privacy: An Enterprise perspective on Risks and compliance,im Mather, Subra Kumaraswamy, Shahed Latif,O reilly,SPD,rp2011.

## X. COURSE PLAN:

At the end of the course, the students are able to achieve the following course learning outcomes.

| Lecture No.                | Learning Objectives   | Topics to be covered  | Reference  |
|----------------------------|---|---|--|
| 1-2<br>3<br>4-5<br>6<br>8  | To Understand The Different Types Of Systems, System Models                         | System Modeling, Clusters And Virtualization  | T2:10-58   |
| 17<br>18<br>19<br>20<br>21 | To Understand Different Types Of Clusters', Different Types Of Clusters'            | Computer Clusters   | T2:68-168  |
| 22<br>23<br>24<br>25<br>26 | To Define The Definition Of Scalable Computing And Virtualization, Virtual Machines | Scalable Parallel Computing.<br>Computer Clusters For Scalable Parallel Computing.<br>Virtual Machines And Virtualization Of Clusters And Data Centers.   | T2:174-286   |
| 27<br>28                   | To Understand What Is Cloud And Able To Define Cloud And Its Uses                   | Enterprise cloud computing Paradigm.  | T1:97-158  |
| 29<br>30-34<br>35          | To Understand The Infrastructure Of Cloud And We Are Accessing That From Cloud      | Infrastructure As A Service (IaaS) & Platform And Software As A Service (PaaS/SaaS).<br>Basics Of Infrastructure As A Service (IaaS) & Platform And Software As A Service (PaaS/SaaS).<br>Virtual Machines Provisioning And Migration Services. | T1:126-130<br>T1:140-144<br>T1:145-154               |
| 36-37                      | To Manage The Device Which Are Virtualized  | On The Management Of Virtual Machines For Cloud Infrastructures.  | T1:152-185   |
| 38<br>39<br>40<br>41       | To Understand The Data Storage In Cloud   | Enhancing Cloud Computing Environments Using A Cluster As A Service.<br>Secure Distributed Data Storage In Cloud Computing.<br>Aneka, Comet Cloud, T-Systems.<br>Understanding Scientific Applications For Cloud Environments.                  | T1:193-212<br>T1:221-242<br>T1:252-298<br>T1:345-385 |

|       |   |   |            |
|-------|---|---|------------|
| 42    | To Understand The Applications Of Cloud And Monitoring And Management Of Cloud Applications | Monitoring, Management Applications: An Architecture For Federated Cloud Computing. | T1:393-410 |
| 43-44 |   | Sla Management In Cloud Computing, Resource Cloud Mashups.                          | T1:413-429 |
| 45    |   | Performance Prediction For HPC On Cloud.  | T1:437-445 |
| 46    |   | Best Practices In Architecting Cloud Applications In The AWS Cloud.                 | T1:459-542 |
| 47    |   | Governance And Case Studies.  | T1:551-567 |
| 48    |   | Organizational Readiness And Change Management In The Cloud Age.                    | T1:567-572 |
| 49    |   | Data Security In The Cloud.   | T1:573-588 |
| 50    |   | Achieving Production Readiness For Cloud Services.                                  | T1:593-612 |

**XII. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

| Course Objectives | Program Outcomes |     |     |     |     |     |     |     |     |      |      |      | Program Specific Outcomes |      |      |
|-------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|---------------------------|------|------|
|                   | PO1              | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1                      | PSO2 | PSO3 |
| <b>I</b>          |                  | S   | H   |     |     |     |     |     |     |      |      |      | H                         | S    | H    |
| <b>II</b>         |                  | H   |     |     | S   |     |     |     |     |      |      |      | S                         |      | H    |
| <b>III</b>        |                  |     |     |     |     |     |     |     |     | H    | S    |      | H                         | S    | S    |
| <b>IV</b>         |                  |     | S   |     | H   |     |     |     |     |      |      |      | H                         | S    | S    |
| <b>V</b>          |                  |     |     |     |     |     |     |     |     |      | S    | H    | S                         |      | H    |
| <b>VI</b>         |                  |     |     | H   |     |     | H   |     |     |      |      |      |                           |      |      |
| <b>VII</b>        |                  |     |     |     | S   |     |     |     |     |      |      |      | H                         |      |      |
| <b>VIII</b>       |                  |     |     |     |     |     | H   |     |     |      |      |      | H                         |      |      |

**S – Supportive**

**H - Highly Related**

**XV. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

| Course Outcomes | Program Outcomes |     |     |     |     |     |     |     |     |      |      |      | Program Specific Outcomes |      |      |
|-----------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|---------------------------|------|------|
|                 | PO1              | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1                      | PSO2 | PSO3 |
| 1               | H                |     |     |     |     | S   |     |     |     |      |      |      | H                         |      | H    |
| 2               |                  | S   |     |     |     |     |     |     |     |      | H    |      | S                         | H    |      |
| 3               |                  | H   | S   |     |     |     |     |     |     |      |      |      |                           | H    | H    |
| 4               |                  |     | H   |     | S   |     |     |     |     |      |      |      | S                         | H    |      |
| 5               |                  |     |     |     | H   |     |     |     |     |      | S    |      | H                         |      | S    |
| 6               |                  |     |     |     | S   |     |     | H   |     |      |      |      | H                         | H    | S    |
| 7               |                  | H   |     |     |     |     |     |     |     |      | S    |      | H                         |      | S    |
| 8               |                  |     | H   |     | S   |     | H   |     |     |      | H    |      | H                         | S    |      |
| 9               |                  | S   |     |     |     | S   |     | H   |     |      |      |      | H                         |      |      |
| 10              |                  |     | H   |     | H   |     | S   |     |     |      |      |      | S                         |      |      |
| 11              |                  | H   |     |     |     |     |     |     |     |      |      |      | S                         |      |      |
| 12              |                  |     |     |     | H   |     |     |     |     |      |      |      | S                         |      |      |

**S – Supportive**

**H - Highly Related**

**Prepared by:**

Ms. Ch Sri Vidya, Assistant Professor

**HOD, CSE**