# C:\Users\USER\Downloads\UEM Logo 2019.jpgC:\Users\USER\Downloads\IEM_Logo2019_Whiteboarder.pngUniversity of Engineering and Management

**Institute of Engineering & Management, SaltLake Campus Institute of Engineering & Management, NewTown Campus University of Engineering & Management, Jaipur**

# Syllabus for B. Tech Admission Batch2022

## Subject Name: Cloud Computing & IoT Credit: 2 Lecture Hours: 40

## Subject Code: PCCCS602

**Pre-requisite:** A basic understanding of Networking, public and private networks, and how to architect and implement networking solutions.

## Relevant Links:

Study Material [Coursera](https://www.coursera.org/browse/information-technology/cloud-computing) [NPTEL](https://onlinecourses.nptel.ac.in/noc21_cs14/preview) [LinkedIn Learning](https://learning.linkedin.com/content-library/online-technical-courses/cloud-computing-training) [Infosys Springboard](https://infyspringboard.onwingspan.com/web/en/login)

**COURSE OBJECTIVES:**

1. Understand the necessary theoretical background for computing and storage clouds environments.
2. Know the methodologies and technologies for the development of applications that will be deployed and offered through different cloud computing environments.
3. Ability to comprehend, design, and develop cloud system using some state-of-the-art platform.
4. Cloud computing security architectural issues, Identity management and Autonomic security.

### COURSE OUTCOMES:

**CO 1:** Articulate the main concepts, key technologies, strengths, limitations of cloud computing and the possible applications for state-of-the-art cloud computing.

**CO2:** Identify the architecture and infrastructure of cloud computing, including cloud delivery and deployment models.

**CO3:** Analyze the core issues of cloud computing such as security, privacy, and interoperability.

**CO4:** Analyze appropriate cloud computing solutions and recommendations according to the applications used.

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| **Modul e num ber** | **Topic** | **Sub-topics** | **Text Book Name & Chapter Number** | **Mapping with Industry and International Academia** | **Lecture Hours** | **Corresponding Lab Assignment** |
| 1 | **Cloud Computing Fundamentals , Resource Management and Load Balancing** | Introduction: Distributed Computing and Enabling Technologies, Cloud Fundamentals: Cloud Definition, Evolution, Architecture, Applications, deployment models, and service models.  Virtualization: Issues with virtualization, virtualization technologies and architectures, Internals of virtual machine monitors/hypervisors, virtualization of data centers, and Issues with Multi-tenancy.  Resource Management and Load Balancing: Distributed Management of Virtual Infrastructures, Server consolidation, Dynamic provisioning and resource management, Resource Optimization, Resource dynamic reconfiguration, Scheduling Techniques for Advance Reservation, Capacity Management to meet SLA Requirements, and Load Balancing, various load balancing techniques | T1  Chapter 1 - 4 | ***International Academia:*** (<https://web.stanford.edu/class/cs349d/> )  ***AICTE-prescribed syllabus:*** ([https://www.aicte-](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) [india.org/sites/default/files/](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) [Model\_Curriculum/AICTE](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)  [%20-%20UG%20CSE.pdf](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)  )  ***Industry Mapping:*** Amazon, Microsoft, Google | 8 | 1. Implementation of Para-Virtualization using VM Ware‘s Workstation/ Oracle‘s Virtual Box and Guest O.S. |

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| 2 | **Cloud Services** | Implementation: Study of Cloud computing Systems like Amazon EC2 and S3, Google App Engine, and Microsoft Azure, Build Private/Hybrid Cloud using open source tools, Deployment of Web Services from Inside and Outside a Cloud Architecture. MapReduce and its extensions to Cloud Computing, HDFS, and GFS. | T1  Chapter 9 | **International Standards**  :( <https://web.stanford.edu/class/cs349d/> ) | 8 | 1. Demonstrate and implement IAAS service using AWS (Use t2.Micro) (Free tier eligible) (instance only). 2. Demonstrate and implement Storage as a service using AWS S3 Service. 3. Demonstrate and implement PaaS that is Deploy static Website using AWS S3 Service. 4. Deploy web applications on commercial cloud or create simple word press app using Light sail service in AWS (SAAS). 5. Understand Security of Web Server and demonstration of IAM using own cloud/AWS. |

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|  |  |  |  | ***AICTE prescribed syllabus:*** ([https://www.aicte-](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) [india.org/sites/default/files/](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) [Model\_Curriculum/AICTE](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)  [%20-%20UG%20CSE.pdf](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) )  ***Industry Mapping:*** Amazon |  |  |

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| 3 | **Cloud Security** | Security: Vulnerability Issues and Security Threats, Application level Security, Data level Security, and Virtual Machine level Security, Infrastructure Security, and Multi-tenancy Issues. IDS: host-based and network-based, Security-as-a-Service. Trust Management, Identity Management, and Access Controls Techniques | T2  Chapter 12 | ***International Standards:***  (<https://web.stanford.edu/class/cs349d/> )  ***AICTE prescribed syllabus:*** ([https://www.aicte-](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) [india.org/sites/default/files/](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) [Model\_Curriculum/AICTE](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)  [%20-%20UG%20CSE.pdf](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) )  ***Industry Mapping:***  Amazon, GCP | 8 |  |
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| 4 | **Introduction to IoT** | IoT definition – Characteristics – IoT Complete Architectural Stack –IoT enabling Technologies – IoT Challenges. M2M communication paradigm, Sensors, actuator concepts, Sensor networks, WSN, RFID, data gathering and sensor fusion. Sensors and Hardware for IoT – Hardware Platforms – Arduino, Raspberry Pi, Node MCU. Case study with any one of the boards and data acquisition from sensors. Python MQTT, MQTT Paho application development. Introduction to Node-Red IoT Platform. | T3  Chapter 4 - 5 | ***International Standards:***  (<https://web.stanford.edu/class/cs349d/> )  ***AICTE prescribed syllabus:*** ([https://www.aicte-](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) [india.org/sites/default/files/](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) [Model\_Curriculum/AICTE](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)  [%20-%20UG%20CSE.pdf](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) )  ***Industry Mapping:***  CISCo, Samsara | 8 | 1. Interface a DHT11/DHT22 sensor to read temperature and humidity. 2. Connect an Arduino to a Wi-Fi network. 3. Control devices like LEDs or relays using a mobile app or web interface via Arduino. 4. Use an HC-SR04 sensor to measure distance and display results on the serial monitor or an LCD. 5. Interface a heart rate sensor (e.g., Pulse Sensor) with Arduino and upload real-time health data to a cloud platform. |
| 5 | **Protocols for IoT** | Infrastructure protocol (IPV4/V6/RPL), Device Management Protocols. IoT protocols, fundamentals of Wireless network protocols and standards. Protocol stacks. MQTT, MQTT-SN, XMPP, COAP, GRPC, IoT streaming protocols. Sensor interfacing with various embedded devices, Light weight embedded computing platforms for IoT. IoT Security and Privacy. A Case Study with MQTT/CoAP usage-IoT privacy, security and vulnerability solutions.  Case studies with architectural analysis: IoT applications – Smart City – Smart Water – Smart Agriculture. Advanced topics: IIoT, IoV, IoD, interoperability in IoT, Smart Grid systems, Smart cities application, Sensor cloud, device to cloud. Case study: 5G-IoT, Software defined networks, Edge, Fog and Dew computing. | T3  Chapter 6 -8 & 12 | ***International Standards:***  (<https://web.stanford.edu/class/cs349d/> )  ***AICTE prescribed syllabus:*** ([https://www.aicte-](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) [india.org/sites/default/files/](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) [Model\_Curriculum/AICTE](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)  [%20-%20UG%20CSE.pdf](https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) )  ***Industry Mapping:***  CISCo, Samsara |  |  |

**TEXT BOOK:**

T1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013.

T2. Barrie Sosinsky, “Cloud Computing Bible” John Wiley & Sons, 2010

T3. Introduction to IoT by Sudip Mishra, Cambridge University Press.

**REFERENCEBOOKS:**

1. P. K. Pattnaik, M. R. Kabat and S. Pal, Fundamentals of Cloud Computing, Vikas Publishing House Pvt. Ltd., 2015.
2. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010 •
3. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008
4. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education