Integral University, Lucknow

Effective from Session: 2018-19								
Course Code	CS-606	**Title of the Course**	Advance Cloud Computing	**L**	**T**	**P**	**C**	
Year	II	**Semester**	III	4	0	0	4	
Pre-Requisite	None	**Co-requisite**	None					
Course Objectives	Cloud Computing will develop a broad-based understanding of state-of-the-art technologies, underlying business and technological trends, key systems and artifacts and research directions in modern data center computing, scalable distributed systems, and programming frameworks enabling the widespread adoption of cloud computing. Many will go on to code, design and architect innovative new cloud computing services and offerings, and to develop business processes to exploit opportunities afforded by modern cloud computing.							

Course Outcomes	
CO1	Apply his knowledge to develop a cloud environment using hardware and software virtualization techniques and perform Map Reduce job execution.
CO2	Use common cloud services and components of Hadoop ecosystem in order to solve a real-world problem.
CO3	Utilize the SOA and MVC techniques, classify and cluster Big Data and able to develop a recommendation system.
CO4	Develop highly secured and high-performance cloud applications.
CO5	Develop a research attitude in emerging fields of cloud computing and write Quality research papers.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction to Cloud Computing**	Definition(s) of Cloud Computing, Characteristics of Cloud, Cloud Deployment Models, Cloud Service Models, Driving Factors and Challenges of Cloud and Overview of Applications of Cloud. Virtualization, Load Balancing, Scalability & Elasticity, Deployment, Replication, Monitoring, MapReduce, Identity and Access Management, Service Level Agreements and Billing.	8	1
2	**Cloud Services and Platforms, Hadoop & MapReduce**	various types of cloud services including compute, storage, database, application, analytics, network and deployment services. Overview of Hadoop echo system, MapReduce architecture, MapReduce job execution flow and MapReduce schedulers	8	2
3	**Cloud Application Design, Big-Data Analytics**	cloud application design considerations, cloud application reference architectures, design methodologies such as SOA, CCM and MVC, data storage technologies and cloud deployment approaches. big data analytics approaches: approaches for clustering big data, approaches for classification of big data and recommendation systems	8	3
4	**Cloud Application Benchmarking & Tuning:**	Cloud security challenges, approaches for authorization authentication, identify & access management, data security, data integrity encryption & key management. cloud application workload characteristics, performance metrics for cloud applications, cloud application testing, performance testing tools and a load test and bottleneck detection case study.	8	4
5	**Cloud Computing Case-Studies**	Review of Technical papers from Major journals (IEEE Transactions) and major conferences (IEEE / Springer etc.) on Cloud Computing / Software Engineering / Other Thrust Areas and Presentations by Students on their understanding of the same, after reviewing the papers concerned	8	5

Reference Books:

Cloud Computing A Hands-on Approach by A .Bagha & V.Madisetti [ISBN:978-81-7371-923-3]Published by University Press, pp. 456, Printed in2014

e-Learning Source:

https://nptel.ac.in/courses/106105167

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
CO2	3	2	1	1	1	2	3	2	2	2	3	1	3	2	2
CO3	2	2	2	2	1	1	3	2	3	1	1	2	2	1	2
CO4	3	2	1	2	3	1	1	3	2	2	3	3	2	3	1
CO5	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2018-19								
Course Code	CS-609	**Title of the Course**	Big Data		**L**	**T**	**P**	**C**
Year	II	**Semester**	III		4	0	0	4
Pre-Requisite	None	**Co-requisite**	None					
Course Objectives	1. To study the basic technologies that forms the foundations of Big Data. 2.To study the programming aspects of cloud computing with a view to rapid prototyping of complex applications. 3.To understand the specialized aspects of big data including big data application, and big data analytics. 4.To study different types Case studies on the current research and applications of the Hadoop and big data in industry.							

Course Outcomes	
CO1	Student must be Able to understand the building blocks of Big Data.
CO2	Student must be able to articulate the programming aspects of cloud computing(map Reduce etc.)
CO3	Student must be able to understand the specialized aspects of big data with the help of different big data applications
CO4	Student must be able to represent the analytical aspects of Big Data.
CO5	Student must be know the recent research trends related to Hadoop File System, MapReduce and Google File System etc.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Data structures in Java**	Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization	8	1
2	**Working with Big Data**	Google File System, Hadoop Distributed File System (HDFS) – Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker), Introducing and Configuring Hadoop cluster (Local,Pseudo-distributed mode, Fully Distributed mode), Configuring XML files	8	2
3	**Writing MapReduce Programs**	Understanding Hadoop API for MapReduce Framework, Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner	8	3
4	**Hadoop I/O**	The Writable Interface, WritableComparable and comparators, Writable Classes: Writablewrappers for Java primitives, Text, BytesWritable, NullWritable, ObjectWritable and GenericWritable, Writable collections, Implementing a Custom Writable: Implementing a RawComparator for speed, Custom comparators	8	4
5	**Pig and hive**	Pig Architecture, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces. Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.	8	5

Reference Books:

1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC

2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly, Hadoop in Action by Chuck Lam, MANNING Publ.

3. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss

e-Learning Source:

https://nptel.ac.in/courses/106104189

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	–	–	–	–	–	–	–	–	2	2
CO2	2	2	1	1	1	–	–	–	–	–	–	–	–	2	2
CO3	2	2	1	2	1	–	–	–	–	–	–	–	–	2	2
CO4	2	2	1	2	1	–	–	–	–	–	–	–	–	2	2
CO5	2	2	2	3	2	–	–	–	–	–	–	–	–	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	CS-626	Title of the Course	Internet of Things	L	T	P	C
Year	II	Semester	III	4	0	0	4
Pre-Requisite	None	Co-requisite	None				
Course Objectives	• To understand the fundamentals of Internet of Things. • To build a small low-cost embedded system using Arduino / Raspberry Pi or equivalent boards. • To apply the concept of Internet of Things in the real-world scenario • Develop web services to access/control IoT devices.						

Course Outcomes	
CO1	As per the new technology, a student should perform data transfer operations using IOT that help the students to guide in a formal way to communicate over new IOT devises within a short span of time.
CO2	For a given situation, a student should be able to deal with different structural aspects of designing and he/she can know the use of key technologies that would be used by the students to promote the development of a coherent learning program.
CO3	With the enhancement in technology, IOT deals with the challenges and unique product codes for a particular product so a student should be able to tackle the unique codes and he/she should development different approaches that can continue the legacy of an organization.
CO4	During clustering phenomena, a student should be prepared to deal with principles and policies governed according to the company rules so as to provide better identity management using different models like isolated and federated user identity models.
CO5	A student should know the basic idea of security requirements and vulnerabilities in IOT. He/she should be good enough to deal with the establishment of identity for smart applications to be used in IOT

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	Introduction Characteristics Physical design Protocols Logical design Enabling technologies IoT Levels Domain Specific IoTsIoT vs M2M.	8	1
2	IoT systems management	IoT systems management IoT Design Methodology Specifications Integration and Application Development.	8	2
3	BUILDING IOT WITH RASPBERRY	BUILDING IOT WITH RASPBERRY PI Physical device Raspberry Pi Interfaces Programming APIs / Packages Web services	8	3
4	BUILDING IOT WITH GALILEO/ARDUINO	BUILDING IOT WITH GALILEO/ARDUINO Intel Galileo Gen2 with Arduino Interfaces Arduino IDE Programming APIs and Hacks	8	4
5	CASE STUDIES	CASE STUDIES and ADVANCED TOPICS Various Real time applications of IoT Connecting IoT to cloud Cloud Storage for Iot Data Analytics for IoT Software & Management Tools for IoT	8	5

Reference Books:

1. Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.

2. ArshdeepBahga, Vijay Madisetti, "Internet of Things A hands on approach", Universities Press, 2015.

e-Learning Source:

https://nptel.ac.in/courses/106105166

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO5	PSO6	PSO7
CO1	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2			
CO2	3	2	1	1	1	2		2	2	2	3	1	3	2	2			
CO3	2	2	2	2	1	1		2		1	1	2		1				
CO4	3	2	1	2		1	1	3		2	3	3		3	1			
CO5	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2			

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation