

SAURASHTRA UNIVERSITY

RAJKOT – INDIA



Accredited Grade A by NAAC (CGPA 3.05)

CURRICULAM

FOR

M. Sc. (IT & CA)

(2 Years Full Time: 4 Semester Programme)

**MASTER OF SCIENCE
(Information Technology & Computer Application)**

(Semester 1 & 2)

Effective From June – 2016

M.Sc. (IT & CA)
Saurashtra University
Effective from June - 2016
Master of Science (Information Technology & Computer Application)
M.Sc. (IT & CA)
(2 years Full Time: 4 Semester Programme)

Ordinance:

O. M.Sc.(IT & CA) – 1: Candidate seeking admission to the Master of Science (Information Technology & Computer Application) must have a Bachelor's degree of minimum three years duration with 48% or more in the discipline

1. **B. C. A. with 48% or more**
OR
2. **B. Sc. with 48% or more**
OR
3. **B. E. with 48% or more**
OR
4. **B. Com. (With optional Computer Science) with 48% or more**
OR
5. **B. Pharm. with 48% or more**
OR
6. **B. Arch. with 48% or more**
OR
7. **Any graduate with 48% or more and P.G.D.A.C.A. with 48% or more**
OR
8. **Any graduate with 48% or more and P.G.D.C.A. with 48% or more**

O. M.Sc.(IT & CA) – 2: The duration of the course is full time two academic years. The examination for the Master of Science (Information Technology & Computer Application) course will be conducted under the semester system. For this purpose the academic year is divided into two semesters. No candidate will be allowed to join any other course simultaneously.

O. M.Sc.(IT & CA) – 3: Candidate who have passed an equivalent examination from any other university or examining body and is seeking admission to the M.Sc. (IT & CA) programme shall not be admitted without producing the eligibility certificate from the Saurashtra University.

O. M.Sc.(IT & CA) – 4: No candidate will be admitted to any semester examination for the Master of Science (Information Technology & Computer Application) unless it is certified by the Head of the Department/ Director of institute.

“That candidate has attended the course of study to the satisfaction of the Head of Department/Director of institute)

O. M.Sc.(IT & CA) – 5: Candidate desirous of appearing at any semester examination of the M.Sc.(IT & CA) programme must forward their application in the prescribed form to the Controller of Examination through Head of Department/Director of Institute on or before the date prescribed.

O. M.Sc.(IT & CA) – 6: No candidate will be permitted to reappear at any semester examination, which he/she has already passed.

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O. M.Sc.(IT & CA) – 7: To pass the whole M.Sc.(IT & CA) examination, candidate must clear all the four semester examinations within a period of five years from the date of his/her registration, otherwise candidate has to register him/her self again as a fresh candidate and keep attendance and appear and pass all the four semester examinations .

O. M.Sc.(IT & CA) – 8: There shall be an examination at the end of each four semesters to be known as First semester examination, Second semester examination respectively, at which a student shall appear in the portion of papers practical and Project viva-voce if any, for which he has kept the semester in accordance with the regulations in this behalf.

A candidate whose term is not granted for whatsoever reason shall be required to keep attendance for that semester of terms when the relevant papers are actually taught at the institute.

O. M.Sc.(IT & CA) – 9: A candidate will be permitted to go to the next semester, irrespective he/she is failing in any number of subjects.

O. M.Sc.(IT & CA) – 10: No candidate will be allowed to reappear in examination of any subject which he/she has already passed.

Regulations:

R. M.Sc.(IT & CA) – 1:

The standard of passing the M.Sc. (IT & CA) degree examination will be as under:

- (1) To pass any semester examination of the M.Sc. (IT & CA) degree, a candidate must obtain at least 40% marks in the university examination separately in each course of theory and practical.
- (2) Class will be awarded based on Earned Grade Point, SGPA and CGPA as per rules of University.

R. M.Sc.(IT & CA) – 2. Marks and credit hours of each course

Marks of Internal examination, university examination and credit hours will be as under:

- (1) Total marks of each theory course are 100 (university examination of 70 marks + internal examination of 30 marks).
- (2) Marks of each unit in the course are equal (i.e. 14 Marks). Total marks of each course are $14 \times 5 = 70$ for university examination.
- (3) Credit hours (lectures) for each unit in the course are equal (i.e. 12 hours). Total credit hours (lectures) of each course are $12 \times 5 = 60$.
- (4) Total marks of each practical and project-viva course are 100. No internal examination of marks in practical and project-viva courses.

R. M.Sc.(IT & CA) – 3. Structure of Question Paper

Question Paper contains 5 questions (each of 14 marks). Every question will be asked from corresponding unit as specified in the syllabus of each course. (i.e. Question-1 from Unit No.1 and remaining questions from their corresponding units)

Every question is divided in four parts like (a), (b), (c) and (d). Part (a) contains four objective type questions (not MCQ) like definition, reason, answer in one line, answer in one word etc., each of one marks and no internal option. Part (b) contains two questions each of two marks and student will attempt any one out of two. Part (c) contains two questions each of three marks and student will attempt any one out of two. Part (d) contains two questions each of five marks and student will attempt any one out of two.

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R. M.Sc. (IT & CA) – 4: Following is the syllabus

M.Sc. (IT & CA) (Semester – 1)

SR. NO.	COURSE	No. of LECT./Lab. PER WEEK	CREDIT
1.	CS – 01 APPLICATION DEVELOPMENT USING ADVANCE JAVA	5	5
2.	CS – 02 ADVANCE WEB DEVELOPMENT IN Laravel	5	5
3.	CS – 03 NoSQL DATABASE: MongoDB	5	5
4.	CS – 04 PRACTICAL - 1 (BASED ON CS-01)	5	5
5.	CS – 05 PRACTICAL - 2 (BASED ON CS-02 and CS-03)	5	5
6.	CS – 06 PROJECT DEVELOPMENT (In House)	5	5
Total Credits of Semester – 1			30

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CS – 01: APPLICATION DEVELOPMENT USING ADVANCE JAVA

Objective:

- Learn how to download, setup and configure the Spring Framework
- Explore the Spring Container and Modules
- Understand dependency injection
- Learn aspect oriented programming and how it is used to provide cross cutting concerns
- Understand how Spring deals with transaction management and ORM
- Hibernate: Inheritance mapping collection mapping.
- Understand the HQL.

Pre-Requisites: Students must have strong background of Java programming knowledge and exposure to J2EE technology.

Unit No.	Topics	Details
1	Basics of Spring, Spring with IDE And IOC container	<ul style="list-style-type: none"> • What is Spring • Spring Modules • Spring Application • Spring in Myeclipse • Spring in Eclipse
	Dependency Injection	<ul style="list-style-type: none"> • Constructor Injection • CI Dependent Object • CI with collection • CI with Map • CI Inheriting Bean • Setter Injection • SI Dependent Object • SI with Collection • SI with Map • CI vs SI • Autowiring • Factory Method
	Spring AOP	<ul style="list-style-type: none"> • AOP Terminology • AOP Implementations • Pointcut • Advices
2	Spring JDBC	<ul style="list-style-type: none"> • JdbcTemplate Example • PreparedStatement • ResultSetExtractor • RowMapper

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		<ul style="list-style-type: none"> • NamedParameter • SimpleJdbcTemplate
	Spring with ORM And SpEL	<ul style="list-style-type: none"> • Spring with Hibernate • Spring with JPA • SpEL Examples • Operators in SpEL • variable in SpEL
	Spring 3 MVC and Remoting with Spring	<ul style="list-style-type: none"> • Spring with RMI • Http Invoker • Hessian • Burlap • Spring with JMS
3	OXM Frameworks, Spring Java Mail And Web Integration	<ul style="list-style-type: none"> • Spring with JAXB • Spring with Xstream • Spring with Castor • Spring with Struts2 • Login and Logout Application
	Basics of Hibernate And Hibernate with IDE	<ul style="list-style-type: none"> • Hibernate Introduction • Hibernate Architecture • Understanding First Hibernate application • Hibernate in Eclipse • Hibernate in MyEclipse
	Hibernate Application And Hibernate Logging	<ul style="list-style-type: none"> • Hibernate with annotation • Hibernate Web application • Hibernate Generator classes • Hibernate Dialects • Hibernate with Log4j 1 • Hibernate with Log4j 2
4	Inheritance Mapping	<ul style="list-style-type: none"> • Table Per Hierarchy • Table Per Hierarchy using Annotation • Table Per Concrete • Table Per Concreteusing Annotation • Table Per Subclass • Table Per Subclass using Annotation
	Collection Mapping	<ul style="list-style-type: none"> • Mapping List • One-to-many by List using XML • Many to Many by List using XML • One To Many by List using Annotation • Mapping Bag

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		<ul style="list-style-type: none">• One-to-many by Bag• Mapping Set• One-to-many by Set• Mapping Map• Many-to-many by Map• Bidirectional• Lazy Collection
5	Component Mapping, Association Mapping, Transaction Management, HQL and HCQL	<ul style="list-style-type: none">• One-to-one using Primary Key• One-to-one using Foreign Key
	Named Query, Hibernate Caching and Integration	<ul style="list-style-type: none">• First Level Cache• Second Level Cache• Hibernate and Struts• Hibernate and Spring

References Books

1. Spring and Hibernate - Santosh Kumar K. - Tata McGraw-Hill Publishing
2. Spring persistence with Hibernate - Paul Tepper Fisher and Brian D. Murphy - Apress
3. Spring 4 and Hibernate 4: Agile Java Design and Development McGraw-Hill Education, 2015
4. Pro Spring - Chris Schaefer, Clarence Ho, and Rob Harrop Apress

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CS-02: Advance Web Development in Laravel		
Objective:		
<ul style="list-style-type: none"> ▪ Student should know OOP in PHP ▪ Student should be able to implement Laravel framework ▪ Student should be able to design and code responsive website ▪ Student should be able to meet current modern market requirement and create fruitful products 		
Pre-Requisites: Strong background and Knowledge of HTML, CSS, JavaScript and PHP is mandatory.		
Unit No.	Topic	Details
1	Object Oriented Programming in PHP	The Basics, Properties, Class Constants, Autoloading Classes, Constructors and Destructors, Visibility, Object Inheritance, Scope Resolution Operator (::), Static Keyword, Class Abstraction, Object Interfaces, Anonymous classes, Overloading, Object Iteration, Magic Methods, Final Keyword, Object Cloning, Comparing Objects, Type Hinting, Late Static Bindings, Objects and references
	Bootstrap Basics	Introduction: File Structure, Basic HTML Template, Global Styles, Default Grid System, Basic Grid HTML, Offsetting Columns, Nesting Columns, Fluid Grid System, Container Layouts, Responsive Design, What Is Responsive Design? Implementation: Typography, Code, Tables, Forms, Buttons, Images, Icons, Glyphicons, Dropdown Menus, Button Groups, Button with Dropdowns, Navigations, Navbar, Breadcrumb, Pagination, label, badges, Typographic elements, thumbnails, alerts, progress bar, wells
2	Introduction to Laravel	What is Laravel, features, MVC architecture, structure of laravel application (laravel directory structure),
	Installation	Basic requirements for Laravel, Using Laravel Installer, Using Composer, how does Composer work? Installation, Linux & Windows, Finding and installing new packages
	Configuration	Introduction, Environment configuration, Protecting sensitive configuration, Maintenance mode, database configuration (setting database connection parameter for laravel and artisan)
3	Artisan	Artisan Command Line Tool, database creation, artisan migration, migration structure, creation migration, Database seeding
	Routing in Laravel	Basic Routing, Route Parameters, Route Filters, Named Routes, Route Groups, Sub-Domain Routing, Route Prefixing, Route Model Binding, Throwing 404 Errors, Routing to Controllers
4	Blade Template	Template inheritance, Master layout, Extending the master layout, display variables, Blade conditional statements, Blade Loops, Executing PHP functions in blade

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	SQL Interaction	Introduction, Running Raw SQL Queries, Database Transactions
5	Eloquent ORM	Eloquent ORM Models: Naming conventions, table name & primary keys, timestamps Basic Operations: Create, Retrieve, Update, Delete Using Models, displaying data from models in views.
	Validation	Defining The Routes, Creating The Controller, Writing The Validation Logic, Displaying The Validation Errors, Array validations, creating new validators, Error messages & custom errors Available Validators: Accepted, After (Date), Alpha, Alpha Dash, Alpha Numeric, Array, Before (Date), Between, Boolean, Date, Date Format, Different, Digits, Digits Between, E-Mail, Exists (Database), Image (File), In, Integer, Max, Min, Not In, Numeric, Regular Expression, Required, String Custom validation rules.

References Books

1. Online Laravel 5.2 Documentation (<https://laravel.com/docs/5.2>)
2. Laravel 5 Essentials, Martin Bean, Packet Publishing, ISBN 978-1-78528-301-7
3. Bootstrap, Jake Spurlock, O'reilly, ISBN: 978-1-449-34391-0

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CS – 03: NoSQL DATABASE: MongoDB		
Objective:		
<ul style="list-style-type: none"> ▪ To develop proficiency in the specification, representation and various other types in MongoDB using PHP. ▪ To be able to perform various Analytical as well as to increase the programming skills in PHP using MongoDB. ▪ To get a good understanding regarding various styles in Programming. ▪ To develop a good base for No-SQL queries. 		
Pre-Requisites: Knowledge of PHP is mandatory.		
Unit No.	Topics	Details
1	Introduction to NoSQL Database	<ul style="list-style-type: none"> • Define NoSQL, its characteristics and history, and the primary benefits for using NoSQL databases. • Define the major types of NoSQL databases including a primary use case and advantages/disadvantages of each type. • Describe the factors affecting return on investment for using locally hosted database vs. database-as-a-service.
	Introduction to MongoDB	<ul style="list-style-type: none"> • MongoDB concepts – Databases, collections, and documents • Downloading Installing and running MongoDB, Installing PHP Driver for MongoDB on various OS Platforms • The Data Model and Working with Data
2	Learning MongoDB by implementing web Application	<ul style="list-style-type: none"> • Inserting documents in MongoDB, Querying documents in collection. • Doing advance queries in MongoDB, Updating documents MongoDB, • Deleting documents in MongoDB, Managing relationships between documents
	Using MongoDB with relational Databases	<ul style="list-style-type: none"> • MongoDB and RDBMS together • Defining the relational model
3	Session Management	<ul style="list-style-type: none"> • Understanding HTTP sessions. • Understanding PHP native session handling, • Implementing session handling with MongoDB. • Putting Session Manager. • Building user authentication module, creating login, logout and user profile.
4	Aggregation Queries	<ul style="list-style-type: none"> • Generating Sample Data. • Understanding MapReduce, • Performing MapReduce in MongoDB and PHP, Aggregation using

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		<p>group()</p> <ul style="list-style-type: none"> • Listing distinct values for field • counting documents with count()
	Web Analytics using MongoDB	<ul style="list-style-type: none"> • Logging with MongoDB, • Extracting analytics data with MapReduce • Real-time analytics using MongoDB
5	Handling Files with GridFS	<ul style="list-style-type: none"> • What is Grid? • Storing files in GridFS • Serving files from GridFS • Reading files in chunks
	Database Management	<ul style="list-style-type: none"> • Database Administration • Optimization • Replication • Sharding

References Books

1. MongoDB the definitive guide - O'Reilly Kristina Chodorow & Michal Dirolf
2. MongoDB in Action - Kyle Banker Manning Sheltar Island.
3. The definitive guide to MongoDB - NoSQL Database for cloud and desktop computing. - Apress - Eelco Plugge, Peter membrey and Tim Hawkins
4. PHP and MongoDB Web Development Beginners guide - Rubayeet Islam - Open Source

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CS – 04: PRACTICAL - 1 (BASED ON CS-01)	
Topics	Marks
APPLICATION DEVELOPMENT USING ADVANCE JAVA	100

CS – 05: PRACTICAL - 2 (BASED ON CS-02 and CS-03)	
Topics	Marks
<ul style="list-style-type: none">• ADVANCE WEB DEVELOPMENT IN Laravel• NoSQL DATABASE: MongoDB	100

Note:

- Practical examination may be arranged before or after theory exam.

CS – 06: PROJECT DEVELOPMENT (In House)	Marks: 100
<p>Project must be developed in the computer laboratory of concern institute under the supervision of faculties of concern institute on any subject of current semester. <u>(At the time of Project-Viva examination student must show Project Report (In Hard Copy) along with all the Workouts in workbook, implementation of project in SDLC, Documentation, Program codes and project in running mode)</u></p>	

Note :

- Project must be submitted before two week of commencement of theory exam.
- Project viva examination may be arranged before or after theory exam.
- During the project viva examination project must be run.

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SR. NO.	COURSE	No. of LECT./Lab. PER WEEK	CREDIT
1.	CS – 07 APPLICATOIN DEVELOPMENT USING ADVANCED ANDROID	5	5
2.	CS – 08 INTRODUCTION TO BIG DATA AND HADOOP	5	5
3.	CS – 09 CLOUD COMPUTING	5	5
4.	CS – 10 PRACTICAL - 1 (BASED ON CS-07)	5	5
5.	CS – 11 PRACTICAL - 2 (BASED ON CS-08 and CS-09)	5	5
6.	CS – 12 PROJECT DEVELOPMENT (In House)	5	5
Total Credits of Semester – 2			30

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CS – 07: APPLICATION DEVELOPMENT USING ADVANCED ANDROID		
Objective:		
<ul style="list-style-type: none"> ▪ To be able to develop mobile applications using advanced android api based on ▪ Data storage in external and internal memory and database ▪ To develop app that supports animation, multimedia, camera, sensor ▪ To develop app that supports Network, Bluetooth-Wi-Fi ▪ Developing web service and retrieving data using JSON & xml ▪ Packaging and distributing android app 		
Pre-Requisites: OOPS concepts, Programming in core java, Basic Android Programming.		
Unit No.	Topics	Details
1	Basics of Android & UI Design	<ul style="list-style-type: none"> • Core building blocks, Android manifest.xml file, R.java file, Basic UI widgets, Activity, Layout, Intent
	Working with view and adaptor	<ul style="list-style-type: none"> • Adaptors: Array adaptor, Arraylist adaptor, Base adaptor, • Views: GridView, ScrollView, WebView, SearchView, TabHost, DynamicListView, ExpandedListView
	Multimedia API	<ul style="list-style-type: none"> • Wallpaper, Live Wallpaper, • Audio – Recording audio, Playing audio • Video– Recording video, Playing video • Alarm Manager • Camera - Capturing pictures, configuring camera mode settings, camera parameters, zooming camera.
2	Data Storage & SQLite	<ul style="list-style-type: none"> • Shared Preferences • Android File System • Internal storage, External storage • SQLite : Storing data using SQLite, Querying SQLite database, insert-update-delete operations, Persistent database using SQLiteOpenHelper and creating a database
	Content Provider, Intent & Notifications	<ul style="list-style-type: none"> • Accessing built in content providers • Searching for content • Adding, changing, and removing content • Creating content provider • Sending & Receiving Broadcast • Notifying user, Notifying with status bar
3	Device Connectivity	<ul style="list-style-type: none"> • Bluetooth Tutorial –existence of Bluetooth, enable Bluetooth, discover devices, List Paired Devices, establishing connection between devices. • Working with WiFi
	Working with Sensor	<ul style="list-style-type: none"> • Sensor API, • Working with different sensors :Motion Sensor, Position Sensor, Environmental Sensor, • Sensor Values, SensorManager class, Sensor Class, SensorEvent class, SensorEventListener interface, Compass Accelerometer

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		<ul style="list-style-type: none"> and Orientation Sensors • Reading sensor data, calibrating sensors, determining device orientation
	Android Web Service	<ul style="list-style-type: none"> • Introduction to web service, • Soap Vs Restful web service • Android Restful web service example with java servlet • Storing data into external database • Verifying data in android with external database
4	JSON & XML Parsing	<ul style="list-style-type: none"> • XML Parsing SAX • XML Parsing DOM • XML Pull Parser • JSON Parsing • Integrating Social Networking using HTTP
	WiFi & Bluetooth	<ul style="list-style-type: none"> • Monitoring and managing Internet connectivity • Managing active connections • Managing WiFi networks • Controlling local Bluetooth device • Discovering and bonding with Bluetooth devices • Managing Bluetooth connections • Communicating with Bluetooth
5	Location Based Services and Google Maps	<ul style="list-style-type: none"> • Location Based Services - Finding current location and listening for changes in location, Proximity alerts, Working with Google Maps • Showing google map in an Activity • Map Overlays • Itemized overlays • Geocoder • Displaying route on map
	Drawing, Animation and Graphics programming	<ul style="list-style-type: none"> • Drawing on screen – using canvas and paint • Working with bitmap, shapes • 2D Animation - Drawable, View, Property animation
	Packaging, Deploying and distributing/ selling app	<ul style="list-style-type: none"> • Signing certificate • Distributing android app via Google Play • Obfuscating and optimizing with ProGuard

References Books:

1. Advanced Android Application Development – Joseph Annuzzi, Lauren darcey, Shane Conder – 4th Edition, Addison – Wesley.
2. Android cookbook - Ian F. Darwin Oreilly
3. The Android Developer's CookBook – Building Application with Android SDK – 2nd Edition, Addison – Wesley.

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CS – 08: INTRODUCTION TO BIG DATA AND HADOOP		
Objective:		
<ul style="list-style-type: none"> ▪ Master the concepts of HDFS and MapReduce framework ▪ Understand Hadoop Architecture ▪ Setup Hadoop Cluster and write Complex MapReduce programs ▪ Learn data loading techniques using Sqoop and Flume ▪ Perform data analytics using Pig and Hive ▪ Implement HBase and MapReduce integration ▪ Implement Advanced Usage and Indexing ▪ Implement best practices for Hadoop development ▪ Work on a real life Project on Big Data Analytics 		
Pre-Requisites: Knowledge of Java, SQL and Linux commands is mandatory		
Unit No.	Topics	Details
1	Introduction to Big Data and Hadoop	Introduction/Installation of Virtual Box and the Big Data VM Introduction to Linux - Why Linux? - Windows and the Linux equivalents - Different flavors of Linux - Unity Shell (Ubuntu UI) - Basic Linux Commands (enough to get started with Hadoop)
	Understanding Big Data	Understanding Big Data - 3V (Volume-Variety-Velocity) characteristics - Structured and Unstructured Data - Application and use cases of Big Data Limitations of traditional large Scale systems How a distributed way of computing is superior (cost and scale) Opportunities and challenges with Big Data
	HDFS (The Hadoop Distributed File System)	HDFS Overview and Architecture - Deployment Architecture - Name Node, Data Node and Checkpoint Node (aka Secondary Name Node) - Safe mode - Configuration files - HDFS Data Flows (Read vs Write) How HDFS addresses fault tolerance? - CRC Check Sum - Data replication - Rack awareness and Block placement policy

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		<ul style="list-style-type: none"> - Small files problem HDFS Interfaces - Command Line Interface - File System - Administrative - Web Interface Advanced HDFS features - Load Balancer - DistCp - HDFS Federation - HDFS High Availability - Hadoop Archives
	NoSQL Databases - 1 (Theoretical Concepts)	<ul style="list-style-type: none"> NoSQL Concepts - Review of RDBMS - Need for NoSQL - Brewers CAP Theorem - ACID vs BASE - Schema on Read vs. Schema on Write - Different levels of consistency - Bloom filters Different types of NoSQL databases - Key Value - Columnar - Document - Graph Columnar Databases concepts
2	MapReduce – 1 (Theoretical Concepts)	<ul style="list-style-type: none"> MapReduce overview - Functional Programming paradigms - How to think in a MapReduce way? MapReduce Architecture - Legacy MR vs Next Generation MapReduce (aka YARN/MRv2) - Slots vs Containers - Schedulers - Shuffling, Sorting - Hadoop Data Types - Input and Output Formats - Input Splits - Partitioning (Hash Partitioner vs Customer Partitioner) - Configuration files - Distributed Cache MR Algorithm and Data Flow - Word Count Alternatives to MR - BSP (Bulk Synchronous Parallel) - Adhoc querying - Graph Computing Engines

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	Higher Level Abstractions for MR (Pig)	<p>Introduction and Architecture</p> <p>Different Modes of executing Pig constructs</p> <p>Data Types</p> <p>Dynamic invokers</p> <p>Pig streaming</p> <p>Macros</p> <p>Pig Latin language Constructs (LOAD, STORE, DUMP, SPLIT etc)</p> <p>User Defined Functions</p> <p>Use Cases</p>
3	MapReduce – 2 (Practical)	<p>Developing, debugging and deploying MR programs</p> <ul style="list-style-type: none"> - Stand alone mode (in Eclipse) - Pseudo distributed mode (as in the Big Data VM) - Fully distributed mode (as in Production) <p>MR API</p> <ul style="list-style-type: none"> - Old and the new MR API - Java Client API - Hadoop data types and custom Writables/WritableComparables - Different input and output formats - Saving Binary Data using SequenceFiles and Avro Files <p>Hadoop Streaming (developing and debugging non Java MR programs - Ruby and Python)</p> <p>Optimization techniques</p> <ul style="list-style-type: none"> - Speculative execution - Combiners - JVM Reuse - Compression <p>MR algorithms (Non-graph)</p> <ul style="list-style-type: none"> - Sorting - Term Frequency - Inverse Document Frequency - Student Data Base - Max Temperature - Different ways of joining data - Word Co-Occurrence <p>MR algorithms (Graph)</p> <ul style="list-style-type: none"> - PageRank - Inverted Index
	Higher Level Abstractions for MR (Hive)	<p>Introduction and Architecture</p> <p>Different Modes of executing Hive queries</p> <p>Metastore Implementations</p> <p>HiveQL(DDL & DML Operations)</p> <p>External vs Managed Tables</p> <p>Views</p>

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		Partitions & Buckets User Defined Functions Transformations using Non Java Use Cases Comparison of Pig and Hive
4	NoSQL Databases - 2 (Practical)	HBase Architecture - Master and the Region Server - Catalog tables (ROOT and META) - Major and Minor compaction - Configuration files - HBase vs Cassandra Interfaces to HBase (for DDL and DML operations) - Java API - Client API - Filters - Scan Caching and Batching - Command Line Interface - REST API Advance HBase Features - HBase Data Modeling - Bulk loading data in HBase - HBase Coprocessors - EndPoints (similar to Stored Procedures in RDBMS) - HBase Coprocessors - Observers (similar to Triggers in RDBMS)
5	Spark	- Introduction to RDD - Installation and Configuration of Spark - Spark Architecture - Different interfaces to Spark - Sample Python programs in Spark
	Setting up a Hadoop Cluster using Apache Hadoop	Cloudera Hadoop cluster on the Amazon Cloud (Practice) - Using EMR (Elastic Map Reduce) - Using EC2 (Elastic Compute Cloud) SSH Configuration Stand alone mode (Theory) Distributed mode (Theory) - Pseudo distributed - Fully distributed
	Hadoop Ecosystem and Use Cases	Hadoop industry solutions Importing/exporting data across RDBMS and HDFS using Sqoop Getting real-time events into HDFS using Flume Creating workflows in Oozie Introduction to Graph processing Graph processing with Neo4J

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		Processing data in real time using Storm Interactive Adhoc querying with Impala
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References Books

1. MapReduce Design Patterns Building Effective Algorithms and Analytics for Hadoop and Other Systems By Donald Miner, Adam Shook Publisher: O'Reilly Media
2. Professional Hadoop Solutions By Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich
3. Hadoop The Definitive Guide by Tom White
4. Hadoop Operations, Eric Sammer
5. Hadoop for Dummies by Dirk Deroos
6. Programming Pig Dataflow Scripting with Hadoop By Alan Gates
7. Programming Hive Book by Dean Wampler, Edward Capriolo, and Jason Rutherglen

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CS – 09: CLOUD COMPUTING

Objective:

- To describe cloud computing architecture and services
- To identify cloud platforms and services
- To identify design issues of cloud computing
- To analyze the security factors of implementing cloud environment
- To understand the server virtualization and its implementation
- To review real time applications of cloud computing

Pre-Requisites: Knowledge of Advance Computer Networks is mandatory

Unit No.	Topics	Details
1	Overview of Computing Paradigm	<ul style="list-style-type: none"> • Recent trends in Computing: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing • Evolution of cloud computing: Business driver for adopting cloud computing
	Introduction to Cloud Computing	<ul style="list-style-type: none"> • Cloud Computing (NIST Model): Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers • Properties, Characteristics & Disadvantages: Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing • Role of Open Standards
	Cloud Computing Architecture	<ul style="list-style-type: none"> • Cloud computing stack: Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web service: • Service Models (XaaS): Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS) • Deployment Models: Public cloud , Private cloud, Hybrid cloud, Community cloud
2	Infrastructure as a Service(IaaS)	<ul style="list-style-type: none"> • Introduction to IaaS: IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM): Resource Virtualization: Server ,Storage, Network, Virtual Machine(resource) provisioning and manageability, storage as a service, Data storage in cloud computing(storage as a service) • Examples: Amazon EC2, Renting, EC2 Compute Unit, Platform and Storage, pricing, customers, Eucalyptus
	Cloud Security	<ul style="list-style-type: none"> • Infrastructure Security: Network level security, Host level security,

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		<p>Application level security</p> <ul style="list-style-type: none"> • Data security and Storage: Data privacy and security Issues, Jurisdictional issues raised by Data location, Identity & Access Management, Access Control • Trust, Reputation, Risk • Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations
3	Platform as a Service(PaaS)	<ul style="list-style-type: none"> • Introduction to PaaS: What is PaaS, Service Oriented Architecture (SOA) • Cloud Platform and Management: Computation, Storage • Examples: Google App Engine, Microsoft Azure, Salesforce.com, Force.com platform
	Software as a Service(PaaS)	<ul style="list-style-type: none"> • Introduction to SaaS • Web services • Web 2.0 • Web OS • Case Study on SaaS
	Service Management in Cloud Computing	<ul style="list-style-type: none"> • Service Level Agreements(SLAs) • Billing & Accounting • Comparing Scaling Hardware: Traditional vs. Cloud • Economics of scaling: Benefitting enormously • Managing Data: Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing
4	Virtualization	<ul style="list-style-type: none"> • Virtualization objectives • Virtualization implementation • Virtual servers introduction • Xen server-Hyper V – I, Hyper V – II, VMWare – I, VMWare – II
5	Case Study on Open Source & Commercial Clouds	<ul style="list-style-type: none"> • Eucalyptus • Microsoft Azure • Amazon EC2

Reference Books

1. Kenneth Hess, Amy Newman – Practical Virtualization Solutions – Prentice Hall, 2010
2. Shahed Latif, Tim Mather, Subra Kumaraswamy – Cloud Security and Privacy : An Enterprise perspective on risks and compliance – O’Reilly Media Inc., 2009
3. Gautam Shroff – Enterprise Cloud Computing: Technology, Architecture, Applications – Cambridge University Press, 2010
4. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
5. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg,

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<p>Andrzej M. Goscinski, Wile, 2011</p> <p>6. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012</p> <p>7. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010</p> <p>8. George Reese – Cloud Application Architectures: Building Applications and Infrastructures in the cloud – O’Reilly Media Inc., 2009</p> <p>9. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter – Cloud Computing A practical Approach – McGraw Hill, 2010</p>

CS – 10: PRACTICAL - 1 (BASED ON CS-07)	
Topics	Marks
APPLICATOIN DEVELOPMENT USING ADVANCED ANDROID	100

CS – 11: PRACTICAL - 2 (BASED ON CS-08 and CS-09)	
Topics	Marks
<ul style="list-style-type: none"> • INTRODUCTION TO BIG DATA AND HADOOP • CLOUD COMPUTING 	100

Note:

- Practical examination may be arranged before or after theory exam.

CS – 12: PROJECT DEVELOPMENT (In House)	Marks: 100
<p>Project must be developed in the computer laboratory of concern institute under the supervision of faculties of concern institute on any subject of previous semester or current semester. <u>(At the time of Project-Viva examination student must show Project Report (In Hard Copy) along with all the Workouts in workbook, implementation of project in SDLC, Documentation, Program codes and project in running mode)</u></p>	

Note:

- Project must be submitted before two week of commencement of theory exam.
- Project viva examination may be arranged before or after theory exam.
- During the project viva examination project must be run.