

**Shree Manibhai Virani and Smt. Navalben Virani Science College, Rajkot  
(AUTONOMOUS)  
Affiliated to Saurashtra University, Rajkot**

**Department of Computer Science & Information Technology  
M.Sc. INFORMATION TECHNOLOGY & COMPUTER APPLICATION**

**SEMESTER - I**

<b>16PITCC01</b>	<b>Core 1: Advanced Web Development in LARAVEL</b>	<b>04 hrs/wk</b>	<b>4 Credits</b>
------------------	--	------------------	------------------

**Objectives:**

To enable the students to

1. Understand OOP in PHP
2. Implement Laravel framework
3. Design and code responsive website
4. Meet current modern market requirement and create fruitful products

**Unit -1 Object Oriented Programming in PHP and Bootstrap Basics (10 hrs)**

- **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

**Unit -2 Introduction to Laravel (10 hrs)**

- 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)

**Unit – 3 Artisan and Routing in Laravel (10 hrs)**

- **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

**Unit – 4 Blade Template and SQL Interaction (10 hrs)**

- **Blade Template** : Template inheritance, Master layout, Extending the master layout, display variables, Blade conditional statements, Blade Loops, Executing PHP functions in blade
- **SQL Interaction** : Introduction, Running Raw SQL Queries, Database Transactions

**Unit – 5 Eloquent ORM and Validation (10 hrs)**

- **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.

**Reference Books**

1. *Martin Bean*, 2015, **Laravel 5 Essentials**. Published by Packt Publishing. (UNIT 2 to 5)
2. *Jake Spurlock*, May 2013, **Bootstrap**. Published by O'Reilly Media. (UNIT 1)
3. *Hasin Hayder*, December 2007, **Object-Oriented Programming with PHP5**, Published by Packt Publishing. (UNIT 1)
4. *Terry Matula*, October 2013, **Laravel Application Development Cookbook**, Published by Packt Publishing.
5. *Christopher John Pecoraro*, July 2015, **Mastering Laravel**, Published by Packt Publishing.
6. *Shawn McCool*, November 2012, **Laravel Starter**, Published by Packt Publishing.

<b>16PITCC02</b>	<b>Core 2: No SQL Database MongoDB</b>	<b>04 hrs/wk</b>	<b>4 Credits</b>
------------------	--	------------------	------------------

### **Objectives:**

To enable the students to

1. Develop proficiency in the specification, representation and various other types in MongoDB using PHP
2. Perform various Analytical as well as to increase the programming skills in PHP using MongoDB.
3. Get a good understanding regarding various styles in Programming
4. Develop a good base for No-SQL queries

### **Unit -1 Introduction to NoSQL Database and MongoDB (10 hrs)**

- 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
- 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

### **Unit -2 Learning MongoDB by implementing web Application and Using with RDBMS (10 hrs)**

- Inserting documents in MongoDB, Querying documents in collection.
- Doing advance queries in MongoDB, Updating documents MongoDB
- Deleting documents in MongoDB, Managing relationships between documents
- MongoDB and RDBMS together
- Defining the relational model

### **Unit -3 Session Management (10 hrs)**

- 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.

### **Unit -4 Aggregation Queries and Web Analytics using MongoDB (10 hrs)**

#### **Aggregation Queries :**

- Generating Sample Data.
- Understanding MapReduce,
- Performing MapReduce in MongoDB and PHP, Aggregation using group

### **Web Analytics using MongoDB :**

- Listing distinct values for field
- Counting documents with count()
- Logging with MongoDB,
- Extracting analytics data with MapReduce
- Real-time analytics using MongoDB

### **Unit -5 Handling Files with GridFS and Database Management**

**(10 hrs)**

#### **Handling Files with GridFS :**

- What is Grid?
- Storing files in GridFS
- Serving files from GridFS
- Reading files in chunks

#### **Database Management :**

- Database Administration
- Optimization
- Replication
- Sharding

### **Reference Books**

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

### DISCIPLINE SPECIFIC ELECTIVE - I

(Student shall select any one of the following subject as Elective in 1<sup>st</sup> semester)

S. No	Semester	Theory	
		Course code	Course
1.	I	16PITDC01 /	Application Development using J2EE /
		16PITDC02	Application Development using ASP.NET

16PITDC01	<b>DSE 1: Application Development using J2EE</b>	05 Hours/Week	05 Credits
-----------	--	---------------	------------

#### Objectives:

To enable the students to understand

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

#### Unit - 1 Basics of Spring, Spring with IDE, IOC container and Dependency Injection, Spring AOP (12 Hrs.)

- **Basics of Spring, Spring with IDE and IOC container**
  - What is Spring
  - Spring Modules
  - Spring Application
  - Spring in Myeclipse
  - Spring in Eclipse
- **Dependency Injection**
  - 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**
  - AOP Terminology
  - AOP Implementations
  - Pointcut
  - Advices

**Unit - 2 Spring JDBC, Spring with ORM and SpEL and Spring 3 MVC and Remoting with Spring (12 Hrs.)**

- **Spring JDBC**
  - JdbcTemplate Example
  - PreparedStatement
  - ResultSetExtractor
  - RowMapper
  - NamedParameter
  - SimpleJdbcTemplate
- **Spring with ORM and SpEL**
  - Spring with Hibernate
  - Spring with JPA
  - SpEL Examples
  - Operators in SpEL
  - variable in SpEL
- **Spring 3 MVC and Remoting with Spring**
  - Spring with RMI
  - Http Invoker
  - Hessian
  - Burlap
  - Spring with JMS

**Unit - 3 OXM Frameworks, Spring Java Mail and Web Integration, Basics of Hibernate and Hibernate with IDE and Hibernate Application and Hibernate Logging (12 Hrs.)**

- **OXM Frameworks, Spring Java Mail and Web Integration**
  - Spring with JAXB
  - Spring with Xstream
  - Spring with Castor
  - Spring with Struts2
  - Login and Logout Application
- **Basics of Hibernate and Hibernate with IDE**
  - Hibernate Introduction
  - Hibernate Architecture
  - Understanding First Hibernate application
  - Hibernate in Eclipse
  - Hibernate in MyEclipse
- **Hibernate Application and Hibernate Logging**
  - Hibernate with annotation
  - Hibernate Web application

- Hibernate Generator classes
- Hibernate Dialects
- Hibernate with Log4j 1
- Hibernate with Log4j 2

#### **Unit - 4 Inheritance Mapping and Collection Mapping**

**(12 Hrs.)**

- **Inheritance Mapping**
  - 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**
  - 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
  - One-to-many by Bag
  - Mapping Set
  - One-to-many by Set
  - Mapping Map
  - Many-to-many by Map
  - Bidirectional
  - Lazy Collection

#### **Unit - 5 Component Mapping, Association Mapping, Transaction Management, HQL and HCQL, Named Query, Hibernate Caching and Integration**

**(12 Hrs.)**

- One-to-one using Primary Key
- One-to-one using Foreign Key
- First Level Cache
- Second Level Cache
- Hibernate and Struts
- Hibernate and Spring

#### **Reference Books**

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

<b>16PITDC02</b>	<b>DSE 1: Application Development using ASP.NET</b>	<b>05 Hours/Week</b>	<b>05 Credits</b>
------------------	---	----------------------	-------------------

### Objectives:

To enable the students to

1. Understand the MVC design pattern and how it's applied in ASP.NET MVC
2. Recognize the benefits of using ASP.NET MVC
3. Become equipped to make good choices about model design and use of Microsoft data access technologies
4. Use ASP.NET MVC's routing system to achieve a REST-style architecture
5. Learn how to build a compelling and maintainable HTML user interface using both the ASP.NET and new Razor view engine

### Unit - 1 jQuery (12 Hrs.)

- **Introduction**
  - Need and purpose of JQuery?
  - jQuery Install, jQuery Syntax and Identifying DOM elements
  - Constructing jQuery Selectors The element Selector
  - The #id Selector, The .class Selector.
- **jQuery Events and Effects**
  - Binding event handlers, Removing event handlers
  - \$(document).ready(),click(), blclick()
  - mouseenter(), mouseleave(), mousedown(), mouseup(), hover(), focus(), blur()
  - jQuery Hide/Show, jQuery Fade, jQuery Slide, jQuery Callback
- **jQuery HTML and AJAX**
  - jQuery Get, jQuery Set, jQuery Add,
  - jQuery Remove, jQuery CSS Classes, jQuery css().
  - jQuery and AJAX calls Using the ajax() API, Ajax events
  - Loading data with GET & POST, Working with JSON data.
  - PHP with AJAX what is AJAX. How AJAX Works with ASP.NET Working
  - With Ajax as Background Process

### Unit - 2 ASP.NET MVC Introduction, MVC - Architecture and Pattern (12 Hrs.)

- A Brief History of Web Development
- Traditional ASP.NET Web Forms
- Benefits of ASP.NET MVC
- MVC Architecture, The MVC architecture pattern
- Domain models and Repositories

### Unit - 3 Working with Controllers, Working with Model, Working with Views (15 Hrs.)

- Introducing the Controller
- Templated View Helpers
- Using Metadata for Data Values



- Explicitly Validating a Model
- Displaying Validation Messages
- Working with the ASPX engine and Razor Engine
- Partial Views
- Adding Dynamic Content to a Razor View

**Unit - 4 Working with URLs and Routing (09 Hrs.)**

- About Routing Understanding the Routing Mechanism
- Adding a Route Entry
- Using Parameters
- Using Defaults
- Using Constraints

**Unit - 5 Entity Framework 5 (12 Hrs.)**

- Introducing the Entity Framework
- Code First Approach
- Model first Approach
- Database First Approach

**Reference Books**

1. *Jon Galloway, Phil Haack, Brad Wilson, K. Scott Allen, Scott Hanselman, Professional ASP.NET MVC*, WROX
2. *Jeffrey Palermo, Jimmy Bogard, Eric Hexter, Matthew Hinze, Jeremy Skinner ASP.NET MVC 4 in Action*, Manning

<b>16PITCC03</b>	<b>Core Practical 1:</b> Advanced Web Development in LARAVEL Practical and No SQL Database MongoDB Practical	<b>04 hrs/wk</b>	<b>02 Credits</b>
------------------	---	------------------	-------------------

- Practical based on LARAVEL & MongoDB

<b>16PITDC03</b> / <b>16PITDC04</b>	<b>DSE Practical 1:</b> Application Development using J2EE Practical / Application Development using ASP.NET Practical	<b>04 hrs/wk</b>	<b>02 Credits</b>
---	--	------------------	-------------------

- Practical based on J2EE / ASP.NET

<b>16PITCC04</b>	Project	<b>06 hrs/wk</b>	<b>04 Credits</b>
------------------	---------	------------------	-------------------

- Project Development

## SEMESTER - II

16PITCC05	<b>Core 3: Application Development using Advanced Android</b>	04 hrs/wk	4 Credits
-----------	---	-----------	-----------

### Objectives:

To enable the students to

1. Develop mobile applications using advanced android api
2. Develop app that supports animation, multimedia, camera and sensor
3. Develop app that supports Network and Bluetooth-Wi-Fi
4. Developing web service and retrieving data using JSON & xml
5. Packaging and distributing android app

### Unit -1 Basics of Android

(10 hrs)

- **Basics of Android & UI Design**
  - Core building blocks
  - Android manifest.xml file
  - R.java file
  - Basic UI widgets, Activity, Layout, Intent
- **Working with view and adaptor**
  - Adaptors: Array adaptor, ArrayList adaptor, Base adaptor
  - Views: GridView, ScrollView, WebView, SearchView, TabHost, DynamicListView, ExpandedListView
- **Multimedia API**
  - Wallpapaer, 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

### Unit -2 Data Storage & SQLite, Content Provider, Intent & Notifications

(10 hrs)

- **Data Storage & SQLite**
  - 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**
  - 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

**Unit – 3 Device Connectivity, Working with Sensor, Android Web Service (10 hrs)**

- **Device Connectivity**
  - Bluetooth Tutorial –existence of Bluetooth, enable Bluetooth, discover devices, List Paired Devices, establishing connection between devices
  - Working with WiFi
- **Working with Sensor**
  - Sensor API
  - Working with different sensors :Motion Sensor, Position Sensor, Environmental Sensor
  - Sensor Values, SensorManager class, Sensor Class, SensorEvent class, SensorEventListener interface, Compass Acceslerometer and Orientation Sensors
  - Reading sensor data, calibrating sensors, determining device orientation
- **Android Web Service**
  - 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

**Unit – 4 JSON & XML Parsing, WiFi & Bluetooth (10 hrs)**

- **JSON & XML Parsing, WiFi & Bluetooth**
  - XML Parsing SAX
  - XML Parsing DOM
  - XML Pull Parser
  - JSON Parsing
  - Integrating Social Networking using HTTP
- **WiFi & Bluetooth**
  - 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

**Unit – 5 Location Based Services and Google Maps, Drawing, Animation and Graphics programing, Packaging, Deploying and distributing / selling app (10 hrs)**

- **Location Based Services and Google Maps**
  - 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 programing**
  - Drawing on screen – using canvas and paint
  - Working with bitmap, shapes
  - 2D Animation - Drawable, View, Property animation
- **Packaging, Deploying and distributing / selling app**
  - Signing certificate
  - Distributing android app via Google Play
  - Obfuscating and optimizing with ProGuard

### Reference Books

1. *Joseph Annuzzi, Lauren darcey, Shane Conder, **Advanced Android Application Development*** [4<sup>th</sup> Edition], Addison – Wesley
2. Ian F. Darwin, **Android cookbook**, O'Reilly.
3. *The Android Developer's, **CookBook-Building Application with Android SDK*** [2<sup>nd</sup> Edition], Addison – Wesley

<b>16PITCC06</b>	<b>Core 4: Introduction to Big Data &amp; Hadoop</b>	<b>04 hrs/wk</b>	<b>4 Credits</b>
------------------	--	------------------	------------------

### Objectives:

To enable the students to

1. Master the concepts of HDFS and MapReduce framework
2. Understand Hadoop Architecture
3. Setup Hadoop Cluster and write Complex MapReduce programs
4. Learn data loading techniques using Sqoop and Flume
5. Perform data analytics using Pig and Hive
6. Implement HBase and MapReduce integration
7. Implement Advanced Usage and Indexing
8. Implement best practices for Hadoop development
9. Work on a real life Project on Big Data Analytics

### Unit -1 Introduction to Big Data and Hadoop

(10 hrs)

- **Intruduction**
  - 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
    - 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)**
  - 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

**Unit -2MapReduce – 1 (Theoretical Concepts), Higher Level Abstractions for MR (Pig)  
(10 hrs)**

- **MapReduce – 1 (Theoretical Concepts)**
  - 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
- **Higher Level Abstractions for MR (Pig)**
  - Introduction and Architecture
  - Different Modes of executing Pig constructs
  - Data Types
  - Dynamic invokers
  - Pig streaming
  - Macros
  - Pig Latin language Constructs (LOAD, STORE, DUMP, SPLIT etc)
  - User Defined Functions
  - Use Cases

**Unit -3MapReduce – 2 (Practical), Higher Level Abstractions for MR (Hive) (10 hrs)**

- **MapReduce – 2 (Practical)**
  - Developing, debugging and deploying MR programs
    - Stand alone mode (in Eclipse)
    - Pseudo distributed mode (as in the Big Data VM)
    - Fully distributed mode (as in Production)
  - MR API
    - 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
  - Hadoop Streaming (developing and debugging non Java MR programs - Ruby and Python)
  - Optimization techniques
    - Speculative execution
    - Combiners
    - JVM Reuse
    - Compression
  - MR algorithms (Non-graph)
    - Sorting
    - Term Frequency
    - Inverse Document Frequency
    - Student Data Base
    - Max Temperature
    - Different ways of joining data
    - Word Co-Occurrence
  - MR algorithms (Graph)
    - PageRank
    - Inverted Index

- **Higher Level Abstractions for MR (Hive)**
  - Introduction and Architecture
  - Different Modes of executing Hive queries
  - Metastore Implementations
  - HiveQL(DDL & DML Operations)
  - External vs Managed Tables
  - Views

#### **Unit -4 NoSQL Databases -2 (Practical)**

**(10 hrs)**

- **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)

#### **Unit -5 Spark, Setting up a Hadoop Cluster using Apache Hadoop, HaJdoop Ecosystem and Use Cases**

**(10 hrs)**

- **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



- **HaJdoop 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
  - Processing data in real time using Storm
  - Interactive Adhoc querying with Impala

### **Reference Books**

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

<b>16PITCC07</b>	<b>Core 5 : Cloud Computing</b>	<b>04 hrs/wk</b>	<b>4 Credits</b>
------------------	---------------------------------	------------------	------------------

### **Objectives:**

To enable the students to

1. Describe cloud computing architecture and services
2. Identify cloud platforms and services
3. Identify design issues of cloud computing
4. Analyze the security factors of implementing cloud environment
5. Understand the server virtualization and its implementation
6. Review real time applications of cloud computing

### **Unit -1 Overview of Computing Paradigm, Introduction to Cloud Computing and Cloud Computing Architecture (10 hrs)**

- **Overview of Computing Paradigm**
  - 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**
  - 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**
  - 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

### **Unit -2 Infrastructure as a Service(IaaS), Cloud Security (10 hrs)**

- **Infrastructure as a Service(IaaS)**
  - 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**
  - Infrastructure Security: Network level security, Host level security, Application level security
  - 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

**Unit -3 Platform as a Service (PaaS), Software as a Service (PaaS), Service Management in Cloud Computing (10 hrs)**

- **Platform as a Service (PaaS)**
  - 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)**
  - Introduction to SaaS
  - Web services
  - Web 2.0
  - Web OS
  - Case Study on SaaS
- **Service Management in Cloud Computing**
  - 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

**Unit - 4 Virtualization (10 hrs)**

- Virtualization objectives
- Virtualization implementation
- Virtual servers introduction
- Xen server-Hyper V – I, Hyper V – II, VMWare – I, VMWare – II

**Unit - 5 Case Study on Open Source & Commercial Clouds (10 hrs)**

- Eucalyptus
- Microsoft Azure
- Amazon EC2

## Reference Books

1. *Kenneth Hess, Amy NewMan*, 2010, **Practical Virtualization Solutions**, Prentice Hall
2. *Shahed Latif, Tim Mather, Subra Kumaraswamy* , 2009, **Cloud Security and Privacy : An Enterprise perspective on risks and compliance**, O'Reilly Media Inc.
3. *Gautam Shroff* , 2010, **Enterprise Cloud Computing: Technology, Architecture, Applications**, Cambridge University Press
4. *Barrie Sosinsky*, 2010, **Cloud Computing Bible**, Wiley-India
5. *Rajkumar Buyya, James Broberg, Andrzej M. Goscinski*, 2011, **Cloud Computing: Principles and Paradigms**, Wiley
6. *Nikos Antonopoulos, Lee Gillam*, 2012, **Cloud Computing: Principles, Systems and Applications** , Springer
7. *Ronald L. Krutz, Russell Dean Vines*, 2010, **Cloud Security: A Comprehensive Guide to Secure Cloud Computing**, Wiley-India
8. *George Reese*, 2009, **Cloud Application Architectures: Building Applications and Infrastructures in the cloud**, O'Reilly Media Inc.
9. *Anthony T. Velte, Toby J. Velte, Robert Elsenpeter*, 2010, **Cloud Computing A practical Approach**, McGraw Hill

## DISCIPLINE SPECIFIC ELECTIVE - II

(Student shall select any one of the following subject as Elective in 2<sup>nd</sup> semester)

S. No	Semester	Theory	
		Course code	Course
1.	II	16PITDC05	Web Searching Technologies & Search Engine Optimization /
		16PITDC06	Wireless Communication & Mobile Programming

16UITDC05	<b>DSE - II : Web Searching Technology and Search Engine Optimization</b>	04 hrs/wk	04 Credits
-----------	---	-----------	------------

### Objectives:

To enable the students to understand

1. Basics of search engine
2. How to determine SEO objectives?
3. What kind of problems SEO faces?
4. Which elements affect SEO planning?
5. Keyword research
6. Points to be kept in mind while developing a website to make it - SEO friendly
7. How to optimize vertical search

### Unit - 1 Search Engine Basics: Reflecting Consciousness and connecting Commerce

(10 hrs)

- The Mission of Search Engines
- The Market Share of Search Engines
- The Human Goals of Searching
- Determining Searcher Intent: A Challenge for Both Marketers and Search Engines
- How People Search?
- How Search Engines Drive Commerce on the Web?
- Eye Tracking: How Users Scan Results Pages?
- Click Tracking: How Users Click on Results? Natural Versus Paid
- Understanding Search Engine Results
- Algorithm-Based Ranking Systems: Crawling, Indexing, and Ranking
- Determining Searcher Intent and Delivering Relevant Fresh Content
- Analyzing Ranking Factors

- Using Advanced Search Techniques
- Vertical Search Engines
- Country-Specific Search Engines

**Unit - 2 Determining SEO Objectives and Defining Site's Audience (10 hrs)**

- Setting SEO Goals and Objectives
- Developing an SEO Plan Prior to Site Development
- Understanding Audience and Finding Niche
- SEO for Raw Traffic
- SEO for E-Commerce Sales
- SEO for Mindshare/Branding
- SEO for Lead Generation and Direct Marketing
- SEO for Reputation Management
- SEO for Ideological Influence

**Unit - 3 First Stages of SEO and Keyword Research (10 hrs)**

- The Major Elements of Planning
- Identifying the Site Development Process and Players
- Defining Site's Information Architecture
- Auditing an Existing Site to Identify SEO Problems
- Identifying Current Server Statistics Software and Gaining Access
- Determining Top Competitors
- Assessing Historical Progress
- Benchmarking Current Indexing Status
- Benchmarking Current Rankings
- Benchmarking Current Traffic Sources and Volume
- Leveraging Business Assets for SEO
- Combining Business Assets and Historical Data to Conduct SEO/Website SWOT Analysis
- The Theory Behind Keyword Research
- Traditional Approaches: Domain Expertise
- Site Content Analysis
- Keyword Research Tools
- Determining Keyword Value/Potential ROI, Leveraging the Long Tail of Keyword Demand, Trending, Seasonality, and Seasonal Fluctuations in Keyword demand

**Unit - 4 Developing an SEO-Friendly Website (10 hrs)**

- Making Site Accessible to Search Engines
- Creating an Optimal Information Architecture
- Root Domains, Subdomains, and Microsites
- Optimization of Domain Names/URLs
- Keyword Targeting

- Content Optimization
- Duplicate Content Issues Controlling Content with
- Cookies and Session IDs
- Content Delivery and Search Spider Control
- Redirects, Content Management System (CMS) Issues
- Optimizing Flash
- Best Practices for Multilanguage/Country Targeting

#### **Unit - 5 Optimizing for Vertical Search**

**(10 hrs)**

- The Opportunities in Vertical Search
- Optimizing for Local Search
- Optimizing for Image Search
- Optimizing for Product Search
- Optimizing for News, Blog, and Feed Search
- Others: Mobile, Video/Multimedia Search

#### **Reference Books**

1. *Eric Enge, Stephan Spencer, Rand Fishkin, Jessie C Stricchiola, 2009 , **The Art of SEO : Mastering Search Engine Optimization**, O'Reilly Media*
2. *Jerrri L. Ledford, 2009, **SEO: Search Engine Optimization Bible [2nd Edition]**, Wiley India*
3. *John I Jerkovic, 2009, **SEO Warrior: Essential Techniques for Increasing Web Visibility**, O'Reilly Media*

<b>16UITDC06</b>	<b>DSE - II : Wireless Communication &amp; Mobile Programming</b>	<b>04 hrs/wk</b>	<b>04 Credits</b>
------------------	---	------------------	-------------------

### **Objectives:**

To enable the students to

1. Introduce the concepts and techniques associated with Wireless Cellular Communication systems.
2. Understand the concept of mobile computing.
3. Compare different types of mobile & wireless networks.

### **Unit - 1 Introduction to Mobile Computing (10 hrs)**

- History of Wireless Communications, Types, propagation modes Wireless network architecture, Applications, Security, Concerns and Standards, Benefits, Future.
- Evolution of mobile computing, what mobile users need, SOC and AOC client.
- Mobile computing OS, Architecture for mobile computing, Three tier architecture, design considerations for mobile computing, mobile computing Through internet, making existing applications Mobile-Enabled.

### **Unit - 2 Wireless Technologies (10 hrs)**

- Bluetooth, Radio frequency identification (Rfid), Wireless Broadband, MobileIP: Introduction, Advertisement, Registration, TCP connections, two level addressing, abstract mobility management model, performance issue, routing in mobile host, Ad-hoc networks.
- Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction Oriented TCP., IPv6.

### **Unit - 3 Mobile Technologies (10 hrs)**

- Global system for mobile communication, Global system for mobile communication, GSM architecture, GSM entities, call routing in GSM, PLMN interface, GSM addresses and identifiers, network aspects in GSM, GSM frequency allocation, authentication and security, Short message services, Mobile computing over SMS, SMS, value added services accessing the SMS bearer.

### **Unit - 4 General packet radio service(GPRS) (10 hrs)**

- GPRS and packet data network, GPRS network architecture, GPRS network operation,
- Data services in GPRS, Applications of GPRS, Billing and charging in GPRS.

### **Unit - 5 Wireless Application Protocol (WAP) WAP, MMS, GPRS (10 hrs)**

- application CDMA and 3G Spread-spectrum Technology, CDMA versus GSM, Wireless data, third generation networks, applications in 3G Wireless LAN,
- Wireless LAN advantages, IEEE802.11 standards, Wireless LAN architecture, Mobility in Wireless LAN, Deploying Wireless LAN, Deploying Wireless LAN.



- Mobile ad-hoc networks and sensor networks, wireless LAN security.
- Wi-Fi v/s 3G Voice over Internet protocol and convergence, Voice over IP, H.323 framework for voice over IP, SIP, comparison between H.323 and SIP, Real time protocols.
- Convergence Technologies, call routing, call routing, voice over IP applications, IMS, Mobile VoIP, Security issues in mobile Information security, security techniques and algorithms, security framework for mobile environment.

### Reference Books

1. *Asoke K Telukder, Roopa R Yavagal, 2005, Mobile Computing* Published by Tata McGraw-Hill Education. (UNIT 1 to 5)
2. *James Keogh, 2003, The complete reference J2ME* Published by Tata McGraw-Hill Education. (UNIT 1 to 5)
3. *Ivan Stojmenovic, 2006, Handbook of Wireless Networks and Mobile Computing* Published by A Wiley-Interscience Publication, New-Delhi. (UNIT 1 to 5)
4. *Lothar Merk, Martin Nicklous, Thomas Stober, Uwe Hansmann, 2006, Principles of Mobile Computing*, Springer
5. *Jochen Schiller, 2008, Mobile Communications*, Pearson
6. *Raj Kamal, 2011, Mobile Computing*, Oxford

<b>16PITCC08</b>	<b>Core Practical 2:</b> Application Development using Advanced Android Practical	<b>04 hrs/wk</b>	<b>02 Credits</b>
------------------	---	------------------	-------------------

- Practical based on Advanced Android

<b>16PITCC09</b>	<b>Core Practical 3:</b> Introduction to Big Data & Hadoop Practical & Cloud Computing Practical	<b>04 hrs/wk</b>	<b>02 Credits</b>
------------------	---	------------------	-------------------

- Practical based on Big Data, Hadoop & Cloud Computing

<b>16PITCC10</b>	Project	<b>06 hrs/wk</b>	<b>04 Credits</b>
------------------	---------	------------------	-------------------

- Project Development