

Class: T.Y.BBA (C.A.) (Semester - V)

Paper Code: **BCA3501**

Title of Paper: **Android Application Programming**

Credit: 3

No. of Lectures: 48

A] Learning Objective:

To understand the Android Operating System and develop applications using Google's Android open-source platform

B] Learning Outcome:

Student should be able to develop Android Applications.

Unit No	Topic	No. of lectures
1	Introduction to Android 1.1. Overview 1.2. History 1.3. Features of Android 1.4. Architecture of Android 1.4.1 Overview of Stack 1.4.2 Linux Kernel 1.4.3 Native Libraries 1.4.4 Android Runtime 1.4.5 Application Framework 1.4.6 Applications 1.5. SDK Overview 1.5.1 Platforms 1.5.2 Tools – (JDK, SDK, Eclipse/Android Studio, ADT, AVD, Android Emulator) 1.5.2 Versions 1.6. Creating your first Android Application	04
2	Activities, Fragments and Intents 2.1. Introduction to Activities 2.2. Activity Lifecycle 2.3. Introduction to Intents 2.4. Linking Activities using Intents 2.5. Calling built-in applications using Intents 2.6. Introduction to Fragments 2.7. Adding Fragments Dynamically 2.8. Lifecycle of Fragment 2.9. Interaction between Fragments	05
3	Android User Interface 3.1. Understanding the components of a screen 3.1.1 Views and ViewGroups 3.1.2 LinearLayout 3.1.3 AbsoluteLayout 3.1.4 TableLayout 3.1.5 RelativeLayout 3.1.6 FrameLayout 3.1.7 ScrollLayout 3.1.8 ScrollView	08

	<ul style="list-style-type: none"> 3.2. Adapting to Display Orientation <ul style="list-style-type: none"> 3.2.1 Anchoring Views 3.2.2 Resizing and Repositioning 3.3. Managing Changes to Screen Orientation <ul style="list-style-type: none"> 3.3.1 Persisting State Information during Changes in Configuration 3.3.2 Detecting Orientation Changes 3.3.3 Controlling the Orientation of the Activity 3.4. Utilizing Action Bar <ul style="list-style-type: none"> 3.4.1 Adding Action Items to the Action Bar 3.4.2 Customizing the Action Items and Application Icon 	
4	<p>Designing Your User Interface with Views</p> <ul style="list-style-type: none"> 4.1. Using Basic Views <ul style="list-style-type: none"> 4.1.1 TextView 4.1.2 Button, ImageButton, EditText, CheckBox 4.1.3 ToggleButton, RadioButton, and RadioGroup Views 4.1.4 ProgressBar View 4.1.5 AutoCompleteTextView View 4.2. Using Picker Views <ul style="list-style-type: none"> 4.2.1 TimePicker View 4.2.2 DatePicker View 4.3. Using List Views to Display Long Lists <ul style="list-style-type: none"> 4.3.1 ListView 4.3.2 Using the Spinner View 4.4. Understanding Specialized Fragments <ul style="list-style-type: none"> 4.4.1 Using a ListFragment 4.4.2 Using a DialogFragment 4.4.3 Using a PreferenceFragment 	10
5	<p>Displaying Pictures and Menus</p> <ul style="list-style-type: none"> 5.1. Using Image Views to Display Pictures <ul style="list-style-type: none"> 5.1.1 Gallery and ImageView views 5.1.2 Image Switcher 5.1.3 Grid View 5.2. Using Menus with Views <ul style="list-style-type: none"> 5.2.1 Creating the helper methods 5.2.2 Options Menu 5.2.3 Context Menu 	06
6	<p>Databases – SQLite</p> <ul style="list-style-type: none"> 6.1. Introduction to SQLite 6.2. SQLiteOpenHelper and SQLiteDatabase 6.3. Creating , opening and closing database 6.4. Working with cursors, Insert, Update, Delete 6.5. Building and executing queries 	04
7	<p>Messaging and E-mail</p> <ul style="list-style-type: none"> 7.1. SMS Messaging <ul style="list-style-type: none"> 7.1.1 Sending SMS Messages Programmatically 7.1.2 Getting Feedback after Sending a Message 7.1.3 Sending SMS Messages Using Intent 7.1.4 Receiving SMS Messages 7.1.5 Caveats and Warnings 	03

	7.2. Sending E-mail	
8	Location-Based Services and Google Map 8.1. Display Google Maps 8.1.1 Creating the project 8.1.2 Obtaining the Maps API Key 8.1.3 Displaying the Map 8.1.4 Displaying the Zoom Control 8.1.5 Changing Views 8.1.6 Navigating to a specific location 8.1.7 Adding Markers 8.1.8 Getting the location that was touched 8.1.9 Geocoding and Reverse Geocoding 8.2. Getting Location Data 8.3. Monitoring a Location	08
	Total No. of Lectures	48

Reference Books

1. Beginning Android4 Application Development, By Wei-Meng Lee WILEY India Edition WROX Publication
2. Professional Android 4 Application Development, By Reto Meier WROX Publication
3. The official site for Android developers - <https://developer.android.co>

Class: T.Y.BBA (C.A.) (Semester - V)

Paper Code: **BCA3502**

Title of Paper: **Dot Net Programming**

Credit: 3

No. of Lectures: 48

A] Learning Objectives:

1. To introduce visual programming and event driven programming practically.
2. To enhance applications development skill of the student.

B] Learning Outcome:

Student should be able to

1. Develop Desktop Application.
2. Develop Web Application.

Unit No.	Topic	No. of Lectures
1	Introduction to .Net Framework 1.1 IDE (Integrated Development Environment) 1.2 Event Driven Programming 1.3 .NET Framework 1.4 Architecture of .Net 1.5 Execution Process of .Net Application 1.6 Features of .Net 1.7 Advantages of .Net 1.8 Develop simple .Net Application	06
2	Introduction to VB.Net 2.1 Basics of VB.Net 2.1.1 Operators 2.1.2 Data Types 2.2 Control Structures 2.2.1 Decision making statements 2.2.2 Loops - For, while, do while etc. 2.3 Exit Statements 2.4 Build Console Applications 2.4.1 Methods - Read(), Readline(), Write(), Writeline() etc. 2.5 Build Windows Applications 2.5.1 Controls - Form, TextBox, Button, Label, CheckBox, Listbox, ComboBox, RadioButton, DateTimePicker, MonthCalender, Timer, Progressbar, Scrollbar, PictureBox, ImageBox, ImageList, TreeView, ListView, Toolbar, StatusBar, Datagridview 2.5.2 Menus and PopUp Menu 2.5.3 Predefined Dialog controls 2.5.4 DialogBox - InputBox(), MessageBox(), MsgBox()	10

3	Object Oriented Programming in VB .Net 3.1 Class and Object 3.2 Properties, methods and events. 3.3 Constructors and Destructors 3.4 Method overloading 3.5 Inheritance 3.5.1 MyBase , MyClass keywords. 3.6 Access modifiers: Public, Private, Protected, Friend. 3.7 Method Overriding. 3.8 Interfaces. 3.9 Polymorphism. 3.10 Exception Handling	06
4	Architecture Of ADO.Net 4.1 Database : Connection, Command, DataAdapter ,DataSet, DataReader, DataTable 4.2 Connection to database with Server Explorer 4.3 Multiple Table Connection 4.4 Data binding with controls like TextBox, ListBox, DataGrid. 4.5 Navigating data source 4.6 DataGridView, DataFormwizard, Data validation	10
5.	Crystal Report 5.1 Connection to Database, Table, Queries, Building Report, Modifying Report, Formatting Fields and Object 5.2 Header, Footer, Working with formula fields, Parameter fields, Special fields 5.3 Working with Multiple Tables.	08
6.	ASP.Net Web Forms 6.1 Introducing ASP.NET web forms: The Role of HTTP, The Role of HTML, The Role of Client Side Scripting, Posting Back to the Web Server, 6.2 Interacting with the Incoming HTTP Request, Interacting with the Outgoing HTTP Response, 6.3 The Life Cycle of an ASP.NET Web Page, ASP.NET Web Controls, 6.4 Master Pages, and Themes: Understanding the Nature of Web	08

	Controls, Building the ASP.NET Cars Web Site, The Role of the Validation Controls, Working with Themes	
	Total No. of Lectures	48

Reference Books:

1. Programming Microsoft Visual Basic.NET – Francesco Balena
2. The Complete Reference -Visual Basic .NET – Jeffrey R. Shapiro
3. Murach’s VB.NET database programming with ADO.NET -Anne Prince and Doug Lowe
4. The Visual Basic.NET COACH
5. Visual Basic .NET 2003 in 21 Days. – Steven Holzner, SAMS Publications.
6. Mastering Crystal Report - BPB Publication
7. Crystal Report – The Complete Reference:- Tata McGraw Hill

Class: T.Y.BBA (C.A.) (Semester - V)

Paper Code: **BCA3503A**

Title of Paper: **Cloud Computing**

Credit: 3

No. of. Lectures: 48

A] Learning Objectives:

1. To understand evolution of cloud computing.
2. To learn and apply the concept of virtualization.
3. To analyze different cloud computing architectures and methods.
4. To evaluate the role of SOA and distributed computing.
5. To learn to create applications using parallel and distributed programming concepts.

B] Learning Outcome:

Students will be able to

1. Understand how cloud computing has evolved.
2. Apply virtualization techniques.
3. Analyze the different architectures followed in cloud computing
4. Evaluate the use of SOA and Distributed computing.
5. Develop applications using parallel & distributed programming.

Unit No.	Topic	No. of Lectures
1	Introduction to Cloud 1.1 Scalable Computing over the Internet 1.2 Technologies for Network based Systems 1.3 System Models for Distributed and Cloud Computing 1.4 Software Environments for Distributed Systems and Cloud 1.5 Performance, Security and Energy Efficiency 1.6 Clustering for Massive Parallelism 1.7 Computer Clusters and MPP Architecture 1.8 Design principles of Computer Clusters.	09
2	Virtualization 2.1 Implementation Levels of Virtualization 2.2 Virtualization Structures 2.3 Tools and Mechanisms 2.4 Virtualization of CPU, Memory, I/O Devices 2.5 Virtual Clusters and Resource Management 2.6 Virtualization for Data-Center Automation.	09
3	Cloud Architecture 3.1 Cloud Computing and Service models 3.2 Data center design and interconnection networks 3.3 Architectural Design of Compute and Storage Clouds 3.4 Public Cloud Platforms 3.5 Inter Cloud resource management 3.6 Cloud Security and Trust Management.	10
4	SOA for Distributed Computing 4.1 Services and SOA 4.2 Message Oriented Middleware 4.3 Portals and Science Gateways	10

	4.4 UDDI and Service Registries 4.5 Publish-Subscribe ,Metadata ,Semantic Web and Grid 4.6 Basic Workflow –Workflow Standards ,Architecture ,Specification , Workflow Execution Engine.	
5	Programming Model 5.1 Parallel and Distributed Programming Paradigms 5.2 MapReduce , Twister and Iterative MapReduce 5.3 Hadoop Library from Apache 5.4 Mapping Applications 5.5 Programming Support 5.6 Google App Engine, Amazon AWS 5.7 Microsoft Azure– Eucalyptus –Nimbus - Open Nebula, OpenStack. 5.8 CloudSim –Architecture , Cloudlets ,VM creation ,Broker ,VM allocation ,Hosts ,DataCenter.	10
Total No. of Lectures		48

Reference Book:

1. Ronald L. Krutz, Russell Dean Vines, “Cloud Security – A comprehensive Guide to Secure Cloud Computing”, Wiley – India, 2010.
2. John W. Rittinghouse and James F. Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2010.
3. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud”, O’Reilly, 2009.
4. Rajkumar Buyya, Christian Vecchiola, S. Tamarai Selvi, “Mastering Cloud Computing”, TMH, 2013.
5. James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
6. William von Hagen, “Professional Xen Virtualization”, Wrox Publications, 2008.
7. Frank P Coyle, “XML, Web Services and the Data Revolution”, Pearson Education, 2007.

Class: T.Y.BBA (C.A.) (Semester - V)
Paper Code: **BCA3503B**

Title of Paper: **Internet of Things**

Credit: 3

No. of. Lectures: 48

A] Learning Objectives:

1. To understand Smart Objects and IoT Architectures
2. To learn about various IoT-related protocols
3. To build simple IoT Systems using Arduino and Raspberry Pi.
4. To understand data analytics and cloud in the context of IoT
5. To develop IoT infrastructure for popular applications

B] Learning Outcome:

Student should be able to

1. Identify the Components that forms part of IoT Architecture.
2. Determine the most appropriate IoT Devices and Sensors based on Case Studies.
3. Setup the connections between the Devices and Sensors.
4. Evaluate the appropriate protocol for communication between IoT.
5. Analyze the communication protocols for IoT.

Unit No	Name of Topic	No. of Lectures
1	Fundamentals of IoT Evolution of Internet of Things 1.1 Enabling Technologies 1.2 IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models 1.3 Simplified IoT Architecture and Core IoT Functional Stack 1.4 Fog, Edge and Cloud in IoT 1.5 Functional blocks of an IoT ecosystem 1.6 Sensors, Actuators, Smart Objects and Connecting Smart Objects 1.7 Security concerns and challenges	09
2	IOT Protocols 2.1 IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN 2.2 Network Layer: IP versions, Constrained Nodes and Constrained Networks 2.3 Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks 2.4 Application Transport Methods: Supervisory Control and Data Acquisition 2.5 Application Layer Protocols: CoAP and MQTT	09

3	Design & Development 3.1 Design Methodology 3.2 Embedded computing logic 3.3 Micro-controller, System on Chips 3.4 IOT system building blocks 3.5 Arduino 3.6 Board details, IDE programming 3.7 Raspberry Pi 3.8 Interfaces and Raspberry Pi with Python Programming.	09
4	Data Analytics And Supporting Services 4.1 Structured Vs Unstructured Data 4.2 Data in Motion Vs Data in Rest 4.3 Role of Machine Learning 4.4 No SQL Databases 4.5 Hadoop Ecosystem 4.6 Apache Kafka, Apache Spark 4.7 Edge Streaming Analytics and Network Analytics 4.8 Xi vely Cloud for IoT, Python Web Application Framework 4.9 Django 4.10 AWS for IOT 4.11 System Management with NETCONF 4.12 YANG	09
5	Case Studies/ Industrial Applications 5.1 Cisco IOT system 5.2 IBM Watson IOT platform 5.3 Manufacturing 5.4 Converged Plantwide Ethernet Model (CPwE) 5.5 Power Utility Industry 5.6 GridBlocks Reference Model 5.7 Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control	12
Total No. of Lectures		48

Reference Books:

1. Arshdeep Bahga, Vijay Madiseti, —Internet of Things –A hands-on approach, Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi, —The Internet of Things –Key applications and Protocols, Wiley, 2012 (for Unit 2).
3. Jan Höller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, “From Machine-to-Machine to the Internet of Things –Introduction to a New Age of Intelligence”, Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O’Reilly Media, 2011.
6. Dieter Uckelmann, Mark Harrison, Florian Michahelles, Architecting the Internet of Things, Springer publications.
7. Marco Schwartz, Internet of Things with Arduino Cookbook, Packt Publications.
8. Internet of Things and Data Analytics, Wiley Publications.

Class: T.Y.BBA (C.A.) (Semester - V)

Paper Code: **BCA3504A**

Title of Paper: **Digital Marketing**

Credit: 3

No. of Lectures: 48

A] Learning Objectives:

1. To give knowledge about using digital marketing in and as business.
2. To make SWOT analysis, SEO optimization and use of various digital marketing tools.
3. To create a measurable and goal oriented website or marketing plan.

B] Learning Outcome:

Student should be able to

1. Explain why we get a huge list of webpages as a result of a search.
2. Examine why a certain webpage is ranked higher compared to others.
3. Organize how we can ethically boost the ranking of our webpage.
4. Describe some of the latest technologies used in Digital Marketing.

Unit No.	Topic	No. of Lectures
1	Introduction 1.1 Understanding Internet Marketing 1.2 Search Engine Optimization 1.3 Search Engine Marketing 1.4 Email Marketing 1.5 Digital Display Marketing	04
2	Introduction to New Age Media (Digital) Marketing 2.1 What is Digital Marketing 2.2 Digital vs. Real Marketing 2.3 Digital Marketing Channels 2.4 Types of Digital Marketing(Overview)-Internet Marketing ,Social Media Marketing, Mobile Marketing	04
3	Creating Initial Digital Marketing Plan 3.1 Content management 3.2 SWOT analysis: Strengths, Weaknesses, Opportunities, and Threats 3.3 Target group analysis EXERCISE: Define a target group	04
4	Marketing using Web Sites 4.1 Web design 4.2 Optimization of Web sites 4.3 MS Expression Web EXERCISE: Creating web sites, MS Expression	04
5	Search Engine Optimization 5.1 SEO Optimization 5.2 Writing the SEO content EXERCISE: Writing the SEO Content	04
6	Customer Relationship Management 6.1 Introduction to CRM 6.2 CRM platform	04

	6.3 CRM models EXERCISE: CRM strategy	
7	Social Media Marketing 7.1 Understanding Social Media Marketing 7.2 Social Networking (Facebook, LinkedIn, Twitter, etc.) Social Media (Blogging, Video Sharing - Youtube, Photosharing – Instagram, Podcasts) 7.3 Web analytics - levels 7.4 Modes of Social Media Marketing 7.4.1 Creating a Facebook page Visual identity of a Facebook page , Types of publications, Facebook Ads , Creating Facebook Ads , Ads Visibility 7.4.2 Business opportunities and Instagram options Optimization of Instagram profiles , Integrating Instagram with a Web Site and other social networks ,Keeping up with posts 7.4.3 Business tools on LinkedIn Creating campaigns on LinkedIn , Analyzing visitation on LinkedIn 7.4.4 Creating business accounts on YouTubeYouTube ,Advertising , YouTube Analytics 7.4.5 E-mail marketing E-mail marketing plan , E-mail marketing campaign analysis , Keeping up with conversions 7.5 Digital Marketing tools: Google Ads, FaceBook Ads, Google Analytic, Zapier, Google Keyword Planner EXERCISE: Social Media Marketing plan. EXERCISE: Making a Facebook page and Google Ads	20
8	Digital Marketing Budgeting 8.1 Resource planning 8.2 Cost estimating 8.3 Cost budgeting 8.4 Cost control	04
Total No. of Lectures		48

Reference Books:

- 1) Digital Marketing for Dummies By Ryan Deiss and Russ Hennesberry
- 2) Advertising and Promotion: An Integrated Marketing Communications Perspective, George Belch, San Diego University Michael Belch, San Diego University
- 3) Advertising Management: Rajeev Batra, John G. Myers, David A. Aaker
- 4) Belch: Advertising & Promotions (TMH) 5) The Social Media Bible: Tactics, Tools, & Strategies for Business Success by Lon Safko 6) Web Analytics 2.0 – AvinashKaushik

Class: T.Y.BBA (C.A.) (Semester - V)
 Paper Code: **BCA3504B**

Title of Paper: **Machine Learning**

Credit: 3

No. of. Lectures: 48

A] Learning Objectives:

1. To study the basics of machine learning.
2. To learn linear models.
3. To understand distance-based clustering techniques.
4. To know about tree and rule-based models.
5. To understand ensemble learning.

B] Learning Outcome:

Students should be able to

1. Understand the concepts of machine learning
2. Apply the linear modelling techniques to solve a problem
3. Understand distance-based clustering techniques
4. Design tree and rule-based models
5. Apply ensemble learning techniques

Unit No.	Topic	No. of Lectures
1	Introduction to Machine Learning 1.1 Task: problems solved with machine learning, Looking for structure, performance evaluation - 1.2 Models: Geometric models, Probabilistic models, Logical models, Grouping and grading 1.3 Features 1.4 Binary Classification: Classification, Scoring and ranking, Class probability estimation 1.5 Handling more than two classes 1.6 Regression-Movie genre identification and rating system	9
2	Linear Models 2.1 Concepts: Supervised, Unsupervised and Descriptive learning 2.2 Hypothesis space 2.3 Linear classification 2.3.1 Univariate linear regression 2.3.2 Multivariate linear regression 2.3.3 Logistic regression 2.4 Perceptron 2.5 Multilayer neural networks 2.6 Learning neural networks structures 2.7 Support vector machines 2.8 Credit card approval system	9

3	Distance Based Models 3.1 Distance and measure 3.2 Neighbours and examples 3.3 Nearest neighbour classification 3.4 Distance based clustering: K-means algorithm, clustering around medoids 3.5 clustering using kernels 3.5.1 Silhouettes 3.5.2 Hierarchical clustering 3.5.3 Document clustering	10
4	Tree & Rule Models 4.1 Decision trees 4.2 Ranking and probability estimation trees 4.3 Regression trees 4.4 Clustering trees 4.5 Ordered rule lists 4.6 Unordered rule lists 4.7 Descriptive rule 4.8 First- order rule 4.9 Spam filtering	10
5	Model Ensembles 5.1 Features 5.1.1 Kinds of feature 5.1.2 Feature transformation 5.1.3 Feature Construction and Selection 5.2 Ensemble learning: Bagging and random forests 5.3 Boosting: Boosted rule learning 5.4 Mapping the ensemble landscape : Bias, variance, margin, other ensemble methods 5.5 Meta learning-Diabetes diagnosis system.	10
Total No. of Lectures		48

Reference Book:

1. Brink Henrik, Richards Joseph W & Fetherolf Mark, "Real-World Machine Learning", 2nd Edition, Drea mtech Press, 2017
2. Manaranjan Pradhan and Dinesh Kumar U., "Machine Learning using Python", Wiley India Pvt. Ltd., 2019.
3. K. P. Murphy, "Machine Learning: A probabilistic perspective", MIT Press, 2012.
4. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007. M. Mohri, A. Rostamizadeh, and A. Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.

Class: T.Y.BBA (C.A.) (Semester - VI)

Paper Code: BCA3601

Title of Paper: Data Analytics

Credit: 3

No. of Lectures: 48

A] Learning Objectives:

1. To develop relevant **programming** abilities.
2. To demonstrate proficiency with statistical **analysis of data**.
3. To develop the ability to build and assess data-based **models**.
4. To demonstrate skill in **data management**.
5. To apply data science concepts and methods to **solve** problems in real-world contexts and will **communicate** these solutions effectively

B] Learning Outcome:

Student should be able to

1. Know demonstrate proficiency with statistical **analysis of data**.
2. Use the skill in **data management** technologies
3. Develop and apply data science concepts and methods to **solve** problems in real world

Unit No.	Contents	No. of Lectures
1	Introduction to data Science o Basics of Data 1.1 What is Data Science? 1.2 Data science process 1.3 Stages in data science project 1.4 Basics of Data Analytics 1.5 Types of Analytics – Descriptive, Predictive, Prescriptive 1.6 Statistical Inference 1.7 Populations and samples 1.8 Statistical modelling, 1.9 Probability 1.10 Distribution 1.11 Correlation 1.12 Regression	12
2	Introduction to Machine Learning 2.1 Basics of Machine Learning 2.2 Supervised Machine Learning K- Nearest- Neighbours, Naïve Bayes Decision tree Support Vector Machines 2.3 Unsupervised Machine Learning, Cluster analysis, K means, Association Rule Mining 2.4 Apriori algorithms 2.5 Regression Analysis Linear Regression, Nonlinear Regression	12
3	Data Analytics with Python Programming Numpy 3.1 Arrays 3.2 Array indexing 3.3 Datatypes 3.4 Array math o Broadcasting 3.5 SciPy	12

	3.6 Image operations 3.7 Distance between point 3.8 Data analysis and manipulation using Pandas- Importing Data , Creating A Data Frame, Data Frame Methods, Indexing Data Frames, Boolean Indexing , Indexing Using Labels , Multi-Indexing , Merge Data Frames , Sorting Data Frames , Apply Function, Pivot Table, Crosstab, Iterating over rows of a data frame	
4	Data Visualization 4.1 Basic principles, 4.2 Ideas and tools for data visualization Graph 4.3 Visualization, 4.4 Data Summaries, 4.5 Model Checking & Comparison, 4.6 Purpose of visualization, 4.7 Multidimensional visualization, 4.8 Tree visualization, 4.9 Graph visualization, 4.10 Visualization techniques, 4.11 Understanding analytics output and their usage, 4.12 Scikit package, 4.13 matplotlib library, 4.14 Plotting , 4.15 Subplots Image	12
	Total No. of Lectures	48

Reference Books:

1. The elements of statistical learning. Hastie, Trevor, et al., Vol. 2. No. 1. New York: springer, 2009.
2. Applied statistics and probability for engineers. Montgomery, Douglas C., and George C. Runger. John Wiley & Sons,2010
3. Scaling up Machine Learning to White “Hadoop: The Definitive Guide” Third Edition, Bekkerman et al., O’reilly Media, 2012.
4. “Mining of Massive Datasets”, Anand Rajaraman and Jeffrey David Ullman, Cambridge University Press, 2012. 5. Developing Analytic Talent: Becoming a Data Scientist, Vincent Granville, wiley, 2014

Class: T.Y.BBA (C.A.) (Semester - VI)

Paper Code: BCA3602

Title of Paper: NOSQL Databases

Credit: 3

No. of. Lectures: 48

A] Learning Objectives:

1. Students will understand fundamental concepts of a number of different NOSQL products.
2. Students will also comprehend with advanced topics like Google App Engine data store and Amazon Simple DB.
3. Students will also learn various CRUD operations and the querying mechanisms in NOSQL

B] Learning Outcome:

Student should be able to

1. Assimilate fundamental concepts in the context of a number of different NOSQL products.
2. Construct refined logical database model with consideration of data semantics and dependency.
3. Execute various CRUD operations with MongoDB.
4. Build a database system and demonstrate competence with the fundamental tasks involved with its modeling, designing, and implementation.
5. Use the MongoDB tools to develop and deploy your applications.
6. Implement Java/ Python / PHP web application for a real world problem with MongoDB.

Unit No.	Contents	No. of Lectures
1	Introduction to NOSQL 1.1 Definition of NOSQL, 1.2 History of NOSQL and different NOSQL Products, 1.3 Exploring Mongo DB java, 1.4 Exploring Mongo DB Ruby/Python, 1.5 Interfacing and Interacting with NOSQL,	10
2	NOSQL Basics 2.1 Understanding the NOSQL architecture, 2.2 Performing CRUD operations, 2.3 Querying NOSQLstores, 2.4 Modifying Data Stores and Managing Evolution, 2.5 Indexing and Ordering Data 2.6 Sets.	10

3	Advanced NOSQL 3.1 NOSQL in cloud, 3.2 Parallel Processing with Map Reduce, 3.3 Big Data with Hive	9
4	Working with NOSQL 4.1 Surveying Database, 4.2 Migrating from RDBMS to NOSQL, 4.3 Web Frameworks and NOSQL, 4.4 Using MYSQL as a NOSQL.	9
5	Developing Web Application with NOSQL and NOSQL administration 5.1 PHP and Mongodb, 5.2 Python and Mongodb, 5.3 Creating Blog application with PHP, 5.4 NOSQL Database Administration	10
Total		48

Reference Books:

1. David Hows, “The definitive guide to MongoDB”, 2nd edition, Apress Publication, 2009, 8132230485.
2. Shakuntala Gupta Edward, “Practical Mongo DB ”, Second edition, Apress Publications, 2016, ISBN 1484206487
3. Daniel Perkins, “Mongo DB, Third Edition, CreateSpace Independent Publishing Platform, 2016, ISBN 152396300
4. Steve Hoberman, “Data Modelling for Mongo DB”, First Edition, Technics Publication, 2014, ISBN 9781935504702

Class: T.Y.BBA (C.A.) (Semester - VI)

Paper Code: BCA3603A

Title of Paper: Big Data

Credit: 3

No. of Lectures: 48

A] Learning Objectives:

- 1 Understand the Big Data Platform and its Use cases
- 2 Provide an overview of Apache Hadoop
- 3 Provide HDFS Concepts and Interfacing with HDFS
4. Understand Map Reduce Jobs
5. Provide Exposure to Data Analytics with R.

B] Learning Outcome:

Student should be able to

1. Identify Big Data and its Business Implications.
2. List the components of Hadoop and Hadoop Eco-System
3. Access and Process Data on Distributed File System Manage Job Execution in Hadoop Environment
4. Develop Big Data Solutions using Hadoop Eco System
5. Apply Machine Learning Techniques using R.

Unit No.	Topic Name	No. of lectures
1	Introduction to Big Data 1.1 Introduction to Big Data 1.2 Types of Digital Data 1.3 Big Data Analytics 1.4 Application of Big data	04
2	Big data Processing: 2.1 Big data technologies, 2.2 Google file system, 2.3 Hadoop Eco System, 2.4 Hadoop architecture, 2.5 Hadoop storage: HDFS 2.6 Hadoop shell commands, 2.7 HDFS read write operations, NameNode, Secondary NameNode and DataNode, MapReduce Job, Task tracker	12
3	HIVE QL: 3.1 Data Types and File Formats 3.2 Databases in Hive 3.3 HiveQL: Data Definition, Data Manipulation, Queries, Views, Indexes, Schema Design	10
4	Data Analysis Using R And Hadoop 4.1 Features of R language 4.2 R and Hadoop Integrated Programming Environment (RHIFE) Introduction, Architecture of RHIFE, RHIFE function reference, Architecture of RHadoop, RHadoop function reference	12

5	Big data and Machine Learning: Machine Learning tools: Spark and SparkML	10
	Total No. of Lectures	48

Reference Books:

1. Scaling up Machine Learning to White “Hadoop: The Definitive Guide” Third Edition, Bekkerman et al., O’reilly Media, 2012.
2. “Mining of Massive Datasets”, Anand Rajaraman and Jeffrey David Ullman, Cambridge University Press, 2012. 5. Developing Analytic Talent: Becoming a Data Scientist, Vincent Granville, wiley, 2014
3. Tom White “ Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012. • Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
4. Prajapati, V. Big data analytics with R and Hadoop. Packt Publishing Ltd, 2013

Class: T.Y.BBA (C.A.) (Semester - VI)

Paper Code: BCA3603B

Title of Paper: BlockChain

Credit: 3

No. of. Lectures: 48

A] Learning Objectives:

1. To Understand how blockchain systems (mainly Bitcoin and Ethereum) work,
2. To securely interact with them,
3. To Design, build, and deploy smart contracts and distributed applications,
4. To Integrate ideas from blockchain technology into their own projects.

B] Learning Outcome:

Student should be able to

1. Understand what Blockchain is and why it is used
2. Explain the different components involved within Blockchain
3. Know when and why you may want to use Blockchain within your environment

Unit	Topic	No of lectures
1	Introduction To Blockchain 1.1 Digital Trust 1.2 Asset 1.3 Transactions 1.4 Distributed Ledger Technology 1.5 Types of network 1.6 Components of blockchain or DLT 1.7 Ledger 1.7.1. Blocks 1.7.2. Blockchain 1.8 PKI and Cryptography 1.8.1. Private keys 1.8.2. Public keys 1.8.3. Hashing 1.8.4. Digital Signature 1.9. Consensus 1.9.1. Byzantine Fault 1.9.2. Proof of Work 1.9.3. Poof of Stake 1.10. Security 1.10.1.DDoS 1.11 Cryptocurrency 1.12.Digital Token	12
2	How Blockchain Works 2.1 How Blockchain Works 2.2. Structure of Blockchain 2.3. Block	12

	<ul style="list-style-type: none"> 2.4. Hash 2.5. Blockchain 2.6. Distributed 2.7. Lifecycle of Blockchain 2.8. Smart Contract 2.9. Consensus Algorithm 2.10 Proof of Work 2.11 Proof of Stake 2.12 Practical Byzantine 2.13 Fault Tolerance 2.14 Actors of Blockchain 2.15 Blockchain developer 2.16 Blockchain operator 2.17 Blockchain regulator 2.18 Blockchain user 2.19 Membership service provider 2.20 Building A Small Blockchain Application 	
3	<p>Introduction to Bitcoin</p> <ul style="list-style-type: none"> 3.1 Currency 3.2 Double Spending 3.3 Cryptocurrency 3.4 P2P Payment Gateway 3.5 Wallet 3.6 Mining 	8
4	<p>Ethereum</p> <ul style="list-style-type: none"> 4.1. Ethereum network 4.2. EVM 4.3. Transaction fee 4.4. Mist 4.5. Ether, gas 4.6. Solidity - Smart contracts 4.7. Truffle 4.8. Web3 4.9. Design and issue Cryptocurrency 4.10. Mining 4.11. DApps 4.12. DAO 	8
5	<p>Introduction To Hyperledger Fabric V1.</p> <ul style="list-style-type: none"> 5.1. Introduction to Hyperledger 5.2 What is Hyperledger 5.3 Why Hyperledger 5.4 Where can Hyperledger be used 5.5 Hyperledger Architecture 5.6 Membership 5.7 Blockchain 5.8 Transaction 5.9 Chaincode 5.10 Hyperledger Fabric 5.11 Features of Hyperledger 	8
	Total No. of Lectures	48

Reference Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
2. Reference Books
 1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
 2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
 3. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger," Yellow paper.2014.
 4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

Class: T.Y.BBA (C.A.) (Semester - VI)

Paper Code: BCA3604A

Title of Paper: Data Mining

Credit: 3

No. of Lectures: 48

A] Learning Objectives:

1. To identify the scope and essentiality of Data Mining.
2. To analyze data, choose relevant models and algorithms for respective applications.
3. To develop research interest towards advances in data mining.

B] Learning Outcome:

Student should be able to

1. Students will become acquainted with both the strengths and limitations of various data mining techniques like Classification, Association analysis and Cluster analysis.
2. Understand Data Mining fundamentals, Data Mining Principles

Unit No.	Name of Topic	No. of Lectures
1	Introduction data mining: 1.1 What is data mining, 1.2 What is not data mining, 1.3 Challenges, 1.4 Other issues	04
2	Data: 2.1 Types of data 2.2 Data quality 2.3 Data pre-processing	06
3	Classification: 3.1 Problem definition, 3.2 General approach, 3.3 Decision tree induction, 3.4 Rule based classifiers, 3.5 Nearest neighbour classifiers, 3.6 Bayesian classifiers, 3.7 Artificial neural networks, 3.8 Support vector machine, 3.9 Ensemble methods, 3.10 Model evaluation	10
4	Association analysis: 4.1 Problem definition, 4.2 Frequent itemset generation, 4.3 Rule generation, 4.4 Challenges,	10

	4.5 Interestingness measures, 4.6 Generalization of association patterns	
5	Cluster analysis: 5.1 Introduction, 5.2 Similarity and distance, 5.3 Density, 5.4 Characteristics of clustering algorithms, 5.5 Center based clustering techniques, 5.6 Hierarchical clustering, 5.7 Density based clustering, 5.8 Other clustering techniques, 5.9 Scalable clustering algorithms, 5.10 Cluster evaluation	10
6	Visualization: 6.1 Introduction, 6.2 General concepts, 6.3 Visualization techniques	8
	Total No. of Lectures	48

Reference Books:

1. *Introduction to Data Mining* by Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, 2005, ISBN: 0321321367

2. *Data Mining: Concepts and Techniques* by Jiawei Han and Micheline Kamber, 2000, ISBN: 1558604898

Class: T.Y.BBA (C.A.) (Semester - VI)

Paper Code: BCA3604B

Title of Paper: Deep Learning

Credit: 3

No. of Lectures: 48

A] Learning Objectives:

1. To introduce students to the basic concepts and techniques of Deep Learning.
2. To develop skills of using recent machine learning software for solving practical problems.

B] Learning Outcome:

Student should be able to

1. Understand various techniques of deep learning
2. Acquaint with neural networks.

Unit	Topic	No of lectures
1	Introduction to Deep Learning 1.1 Why Deep Learning? 1.2 Deep Learning Models 1.2.1 Restricted Boltzmann Machines 1.2.2 Deep Belief Nets 1.2.3 Convolutional Networks 1.2.4 Recurrent Nets	8
2	The Neural Network: 2.1 Building Intelligent Machines, 2.2 The Limits of Traditional Computer Programs, 2.3 The Mechanics of Machine Learning, 2.4 The Neuron, 2.5 Expressing Linear Perceptron as Neurons, 2.6 Feed-forward Neural Networks, 2.7 Linear Neurons and their Limitations, 2.8 Sigmoid Tanh and ReLU Networks, 2.9 Softmax Output Layers.	12
3	Training Feed-Forward Neural Networks: 3.1 The Cafeteria Problem, 3.2 Gradient Descent, 3.3 The Delta Rule and Learning Rates, 3.4 Gradient Descent with Sigmoidal Neurons, 3.5 The Back propagation Algorithm, 3.6 Test Sets, 3.7 Validation Sets, 3.8 Over fitting, 3.9 Preventing Over fitting in Deep Neural Networks.	14
4	Convolution Neural Networks	14

	4.1 Convolutional Neural Networks: 4.2 Neurons in Human Vision, 4.3 The Shortcomings of Feature Selection, 4.4 Vanilla Deep Neural Networks, 4.5 Filters and Feature Maps, 4.6 Full Description of the Convolutional Layer, 4.7 Max Pooling, 4.8 Full Architectural Description of Convolution Networks, 4.9 Closing the Loop on MNIST with Convolutional Networks, 4.10 Image Pre-processing Pipelines Enable More Robust Models.	
	Total No. of Lectures	48

Reference Books:

1. Ethem Alpaydm, Introduction to Machine Learning, PHI, Third Edition,
2. Nikhil Buduma, Fundamentals of Deep Learning, O'Reilly, First Edition,
3. Shai shalev-Shwartz and Shai Ben-David, Understanding Machine Learning(From Theory to Algorithms), Cambridge University Press, First Edition, ISBN No. 978-1-107-51282-5.
4. Christopher M. Bishop, Pattern Recognition and Machine Learning, Mcgraw-Hill, ISBN No. 0- 07-115467-1.
5. Tom Mitchell, Machine Learning, Mcgraw-Hill, First Edition, ISBN No. 0-07-115467-1. 4. Ian Goodfellow and Yoshua Bengio, Deep Learning (Adaptive Computation and machine Learning Series), Massachusetts London, England, ISBN No. 9780262035613.