SARVAJANIK UNIVERSITY
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Faculty of Science

Shree Ramkrishna Institute of Computer Education & Applied Sciences, Surat

M.Sc. Web and Mobile Technology

SEMESTER- 3

DSC 5: Mobile Application Development - 2

Course Code	
Course Title	**Mobile Application Development - 2**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Purpose of Course	The purpose of this course is to give exposure of Flutter framework for mobile application development
Course Objective	This course introduces the foundation of mobile application development using flutter framework to the students. The course also gives students an idea about Google's own language, Dart.
Prerequisite	Sound knowledge on Object Oriented Programming and basic knowledge on Android framework
Course Out come	Course Out come After having completed the course the student will gain: 1. Sound understanding of Dart programming 2. Proficiency in cross platform mobile application development 3. Knowledge about Flutter framework.
Course Content	**Unit 1: Flutter Introduction** 1.1 Features of Flutter 1.2 Advantages of Flutter 1.3 Disadvantage of Flutter 1.4 Flutter installation 1.5 Creating a basic flutter application in the Android Studio **Unit2: Foundation to Dart Programming – part 1** 2.1 Important concepts 2.2 Keywords 2.3 Built-in types -Numbers, Strings, Booleans, Lists, Sets, Maps 2.4 Variables -Default value, Late variables, Final and const 2.5 Operators - arithmetic, relational, Type test operators, logical, bitwise **Unit 3: Foundation to Dart Programming – part 2** 3.1 Control flow statements 3.2 Exception handling 3.3 Functions - Parameters, The main() function, Functions as first-class objects, Anonymous functions **Unit 4: Getting started with Flutter** 4.1 Architecture of flutter framework - widgets, gestures, concepts of

	state, Layers 4.2 Widgets - 4.2.1 Platform specific widgets 4.2.2 Layout widgets 4.2.3 Platform independent / basic widgets 4.3 Layout - 4.3.1 Single child widgets 4.3.2 Multi child widgets 4.4 State management - 4.4.1 Application state scoped model 4.4.2 Navigation and Routing 4.5 Writing Android Specific Code **Unit 5: Flutter Widgets** 5.1 Flutter Scaffold 5.2 Flutter Container 5.3 Flutter Row & Column 5.4 Flutter Text 5.5 Flutter TextField 5.6 Flutter Buttons 5.7 Flutter Card 5.8 Flutter List 5.9 Flutter Images and Icon **Unit 6 : Shared Preferences in Flutter** 6.1 Add the dependency. 6.2 Save data in Preferences. 6.3 Read data from Preferences. 6.4 Remove data from Preferences **Unit 7 Persist data with SQLite** 7.1 Add the dependency 7.2 Access and manipulate data from SQLite **Unit 8: Advanced Programming** 8.1 Flutter Google maps 8.2 Flutter Internationalization
Reference Books	1) Web URL: https://flutter.dev/docs/development 2) Beginning Flutter: A Hands-On Guide to App Development by Marco L. Napoli 3) Beginning App Development with Flutter: Create Cross-Platform Mobile Apps by Rap Payne 4) Flutter for Beginners by Alessandro Biessek 5) Learn Google Flutter Fast: 65 Example Apps by Mark Clow 6) Flutter in Action by Eric Windmill

Teaching Methodology	The course is composed of Lectures, assignments and a group project.
Evaluation Method	70% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 30% assessment is based on semester end written examination

DSC-6 Advanced JavaScript Frameworks

Course Code	
Course Title	**Advanced JavaScript Frameworks**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	
Purpose of Course	The purpose of course is to make students capable of developing effective and interactive web client part of web applications.
Course Objective	To provide Fundamental knowledge of Web client development technologies
Prerequisite	Basic understanding of Web, HTTP, HTML, JavaScript and Object Oriented Concepts.
Course Out come	After completion of this course, the student will be capable of developing effective and interactive web client part of web applications.
Course Content	**Unit 1: Introduction to Angular** 1.1 Features and Advantages of Angular 1.2 Angular Architecture 1.3 Angular Components and Directives **Unit 2: Angular Basics** 2.1 Data Binding 2.1.1 One way Data Binding 2.1.2 Two way Data Binding 2.2 Routing **Unit 3: Introduction to React** 3.1 Basic concept of React 3.2 Difference between AngularJS and ReactJS 3.3 React features **Unit 4: React Basics** 4.1 ECMA Script 4.2 React with JSX 4.2.1 React elements as JSX 4.3 Basic React Components 4.3.1 Stateless functional component 4.3.2 Stateful component 4.3.3 Higher order component 4.3.4 Nesting component 4.4 State and props in React **Unit 5: React Routing**

	5.1 Life cycle of ReactJS 5.1.1 Mounting 5.1.2 Updating 5.1.3 Unmounting 5.2 React Routing 5.2.1 Router properties 5.2.2 Nesting Router **Unit 6: React Forms and Introduction to Redux** 6.1 React Forms 6.2 Introduction to Redux 6.3 Redux building parts – State, Actions, Reducers 6.4 Concept of the store, Action creators, middleware **Unit 7: React – Redux and Hooks** 7.1 Explicitly passing the store 7.2 Presentational Vs container component 7.3 The React Redux provider 7.4 React Redux Connect 7.5 Introduction to Hooks 7.6 Hooks -useState Hook, useEffect Hook, custom Hooks **Unit 8: React Bootstrap Framework (08)** 8.1 Introduction to React Bootstrap Framework 8.2 Layout – Grid structure, Grid API 8.3 Media objects 8.4 Components – Accordion, Button, Dropdowns, Forms, Input group, Carousel, Images, Table 8.5 Utilities - Transitions
Reference Books	1. Pro Angular by Adam Freeman – Apress 2. Beginning Angular with Typescript by Greg Lim 3. Learning React: Learning React: Functional Web Development with React and Redux , O'Reilly 4. Learning React: Modern Patterns for Developing React Apps, O'Reilly 5. Fullstack React: The complete guide to ReactJS and Friends 6. Learning React by Kirupa Chinnathambi
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	70% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 30% assessment is based on semester end written examination

SEC– 3-1: Data Visualization

Course Code	
Course Title	**Data Visualization**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	
Purpose of Course	The purpose of course is to make student capable to develop their own data visualizations, and learn to use Open Source data visualization tools, especially D3.js, Tableau..
Course Objective	To understand technological advancements of data visualization and various data visualization techniques
Prerequisite	Working knowledge of Programming Language and Database Concepts and JavaScript, HTML5
Course Out come	This course is all about data visualization, the art and science of turning data into readable graphics. We'll explore how to design and create data visualizations based on data available and tasks to be achieved.
Course Content	**Unit 1: Introduction to Data Visualization** 1.1 Visualization Process 1.1.1 Filtering and Processing 1.1.2 Translation and Visual representation 1.1.3 Perception and interpretation 1.2 Visualization formats 1.3 Basic principles for data visualization **Unit 2: Working with Data for Visualization** 2.1 Data storytelling 2.2 Working with data 2.2.1 Data clean up 2.2.2 Concept of Loading, parsing, transforming the data **Unit 3: Basics of Data Visualization** 3.1 Reading Data from Standard text files (.txt, .csv, XML) 3.2 working with Data (Continuous, Statistical, Geo-spatial, Discrete) 3.3 Types of Databases for visualization – structured, semi-structured, unstructured 3.4 Displaying JSON content **Unit 4: Basic Visualization HTML5 Libraries** 4.1 Basic HTML5 Drawing Charts 4.2 HTML5 – CANVAS/SVG Charts 4.3 Use of elements with CSS

	4.4 Style properties 4.5 Stroke properties **Unit 5: other Visualization Library – Google Chart** 5.1 Google Charts API Basics 5.2 Various google chart types 5.2.1 column chart, bar chart, line chart, bubble chart, pie chart, Chart Animations **Unit 6: Basic Visualization methods with D3.js** 6.1 Introduction to D3.js 6.2 D3.js Features, benefits 6.3 D3.js Animation 6.4 Drawing basic charts, graphs, geographics **Unit 7: Loading and filtering external data in D3.js** 7.1 D3 functions for loading Data 7.2 Use of Dataset 7.3 Case study: Bar chart with External Data **Unit 8: Advanced Data Visualization with Tableau** 8.1 Introduction to Tableau 8.2 Filters, Drill Down and Up 8.3 Forecasting, Trend Lines, Clustering 8.4 Dashboard
Reference Books	1. Interactive Data Visualization for the Web by Scott Murray 2nd Edition (2017) 2. Jon Raasch, Graham Murray, Vadim Ogievetsky, Joseph Lowery, "JavaScript and jQuery for Data Analysis and Visualization", WROX 3. Ritchie S. King, Visual story telling with D3" Pearson 4. D3.js in Action by Elijah Meeks 2nd Edition (2017) 5. Visual Storytelling with D3: An Introduction to Data Visualization in JavaScript By Ritchie S. King 6. Visualization Analysis & Design by Tamara Munzner (2014) (ISBN 9781466508910) 7. Interactive Data Visualization for the Web by Scott Murray 2nd Edition (2017) 8. ggplot2 Elegant Graphics for Data Analysis by Hadley Wickham
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	70% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 30% assessment is based on semester end written examination

SEC-3-2: Blockchain Technology

Course Code	
Course Title	**Blockchain Technology**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Purpose of Course	Conceptualize the students with the theoretical concepts of Blockchain and its associated areas.
Course Objective	Familiarization with different objectives of blockchain models of blockchain, mechanics of bitcoin, alternative coin and recent trends. Moreover it can be more conceptualized using selected case studies.
Prerequisite	Fundamentals of Information Security concepts.
Course Out come	• Define and Explain the fundamentals of Blockchain • Illustrate the technologies of blockchain • Describe various models of block chain. • Case study of blockchain to analyze the different issues associated with various coins and crypto currencies. • Familiarize the functional/operational aspects of crypto currency. • Understand emerging abstract models for Block chain. • Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain.
Course Content	Introduction to Blockchain, Transactions and Blocks, Mining and Consensus, Connecting the Dots, Smart Contracts, Blockchain Development on Ethereum, Creating a Block, Adding the Hash Function to the Block, Creating Smart Contracts
	Unit 1 Blockchain Fundamentals 1.1. Definition 1.2. History of Blockchains 1.3. How the Blockchain Technology Works 1.4. Cryptographic Keys 1.5. Features of a Blockchain 1.6. Structure of a Blockchain **Unit 2 Picking a blockchain** 2.1 Add substance 2.2 Determining the needs 2.3 Defining the goal 2.4 Drawing decision tree 2.5 Blockchain applications 2.6 Blockchain life cycle **Unit 3 Managing bitcoin blockchain** 3.1 Creating first bitcoin wallet

	3.2 Creating second bitcoin wallet 3.3 Generating bitcoin vanity address 3.4 Transferring vanity address 3.5 Reading blockchain entry in bitcoin 3.6 Using smart contract with bitcoin 3.7 Building smart bond Checking status of the contract 3.8 Mining for bitcoins **Unit 4 Ethereum Blockchain** 4.1 History of Ethereum 4.2 Ether cryptocurrency 4.3 Mining for ether 4.4 Ethereum wallet 4.5Building and managing decentralized autonomous organization – DAO 4.6 Managing smart contracts **Unit 5 Ripple and Factom Blockchain** 5.1 Difference between ripple and other blockchains 5.2 Capacity of ripple 5.3 Caution with ripple 5.4 Factom blockchain 5.5 Authenticating documents and building identities using APIs 5.6 Publishing on Factom **Unit 6 DigiByte** 6.1 Digging into digibyte 6.2 Fast blockchiang 6.3 Mining on Digibyte 6.4 Signing documents on digibyte's DiguSign **Unit 7 Hyperledger** 7.1 Fabric 7.2 Building system in Fabric 7.3 Chaincode development 7.4 Sumeragi 7.5 Sawtooth **Unit 8 Industry Impacts** 8.1 Financial technology 8.2 Real estate 8.3 Insurance 8.4 Government
Text and Reference Bookss	1. Blockchain for dummies by Tiana Laurence –Wiley publication 2. Blockchain from concept to execution by Debajani Mohanty – BPB Publication 3. Blockchain by example by By Bellaj Badr , Richard Horrocks , Xun (Brian) Wu 4. Blockchain for beginners by Kurt Dugan

	5. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder Princeton University Press, 2016 6. Analysis of Blockchain protocol in Asynchronous networksby R.Pass et al EUROCRYPT 2017, (eprint.iacr.org/2016/454), A significant progress and consolidation of several principles 7. Blockchain Technology: Cryptocurrency and Applications S. Shukla, M., Dhawan, S. Sharma, S. Venkatesan Oxford University, Press 2019 8. Bitcoin and cryptocurrency technologies: a comprehensive introduction, Arvind Narayanan et. Al. Princeton University, Press 2016 Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming' Josh Thompson Create Space Independent Publishing Platform 2017
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	70% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 30% assessment is based on semester end written examination

SEC-3-3: Computational Linguistic

Course Code	
Course Title	**Computational Linguistic**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Purpose of Course	The purpose of the course is to make students capable of implementing concepts , methods and tools of computational linguistic.
Course Objective	• To learn about fundamentals of Computational Linguistics. • To learn and implement NLP Concepts.
Prerequisite	Students who have completed any one of the following courses 1) Fundamental of AI 2) Python Programming
Course Out come	After completion of this course, the student will be capable to develop models and implement predictive analytics on social media platforms
Course Content	**Unit 1 Introduction to NLP** 1.1. Natural language vs. programming language 1.2 NLP tasks in syntax, semantics, and pragmatics 1.3. Practical applications **Unit 2 Langauge and Computer** 2.1 The language of locks 2.2. Regular expressions 2.3. A simple chatbot 2.4 Word order and grammar 2.5 The problem of ambiguity. 2.6 The role of machine learning. **Unit 3 Tokenizer and Sentiment Analyzer** 1.1 Stemming 1.2 Building vocabulary with a tokenizer 3.2.1. Dot product 3.2.2. Measuring bag-of-words overlap 3.2.3. A token improvement 3.2.4. Extending vocabulary with n-grams 3.2.5. Normalizing vocabulary 3.3 Sentiment and Text 3.3.1 Naive Bayes Implementation 3.3.2 VADER—A rule-based sentiment analyzer **Unit 4 TF-IDF and Topic Modelling** 4.1. Bag of words 4.2 Vectorizing 4.3 Vector spaces

	4.4 Topic modeling 4.4.1. Relevance ranking 4.4.2. Tools **Unit 5 Finding meaning in word counts (semantic analysis)** 5.1. From word counts to topic scores 5.2. TF-IDF vectors and lemmatization 5.3. Topic vectors 5.4. An LDA classifier 5.5. Latent semantic analysis **Unit 6 Information extraction** 6.1. Named entities and relations 6.1.1. A knowledge base 6.1.2. Information extraction 6.2. Regular patterns 6.2.1. Regular expressions 6.2.2. Information extraction as ML feature extraction 6.3. Information worth extracting 6.3.1. Extracting GPS locations **Unit 7 Named entity extraction and Question answering** 7.1 Extracting relationships (relations) 7.2 Part-of-speech (POS) tagging 7.3 Entity name normalization 7.4 Relation normalization and extraction 7.5 Word patterns 7.6 Segmentation 7.7 Sentence segmentation with regular expressions **Unit 8 Dialogue Engines** 8.1. Language skill 8.1.1 Modern approaches 8.1.2. A hybrid approach 8.2. Pattern-matching approach 8.2.1. A pattern-matching chatbot with AIML 8.2.2. A network view of pattern matching 8.3. Grounding 8.4 Retrieval (search) 8.4.1. The context challenge 8.4.2. Example retrieval-based chatbot 8.4.3. A search-based chatbot 8.5 Machine Translation-machine translation systems, Statistical machine translation
Reference Bookss	1. Natural Language Processing and Information Retrieval-By bSiddiqui and Tiwari, Oxford University Press **2.** Speech and Language Processing - By Jurafsky and Martin, Pearson Education **3.** Natural Language Processing with Python. – Analyzing Text with The Natural Language Toolkit. Steven Bird, Ewan Klein, and

	Edward Loper, O'relly publication 4. The Oxford Handbook of Computational Linguistics 2nd edition Edited by Ruslan Mitkov, Oxford Press 5. Taming Text: How to Find, Organize, and Manipulate It,Grant S. Ingersoll , Thomas S. Morton, Drew Farris, Manning Publication
Teaching Methodology	The course is composed of readings, assignments and a class project.
Evaluation Method	70% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 30% assessment is based on semester end written examination

SEC-3-4: Social Media Mining and Analysis

Course Code	
Course Title	**Social Media Mining and Analysis**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Purpose of Course	The purpose of the course is to make students capable of implementing concepts, methods and tool related to social media mining and unstructured data analysis.
Course Objective	• To learn about social media mining and challenges to it • To learn and implement social data processing and visualization routines • To implement and evaluate various case studies of social media analytics.
Prerequisite	Basic concepts of Fundamental of Data Science Python Programming
Course Out come	After completion of this course, the student will be capable to develop models and implement predictive analytics on social media platforms
Course Content	**Unit 1 Introduction to Social Media Mining and its Challenges** 1.1 What is Social Media Mining 1.2 Users 1.3 Social Networks 1.4 Content 1.5 New Challenges for Mining **Unit 2 Basics of Social Data Analysis** 2.1 Social Networks - Basic Structure and Measures 2.2 Basics of Text Processing over Social Data 2.3 Information Diffusion 2.4 Experimental studies over OSNs **Unit 3 Methods of Social Media Analysis** 3.1 Text Processing 3.3 Information Extraction from Unstrctured Text 3.3 Entity linking and entity resolution for Social data 3.4 Topic Models 3.5 Basic NLP Methods : Stemming, Tokenization, POS Tagging **Unit 4 Social Media Mining Algorithms** 4.1 Data Mining Algorithms : Classification and Clustering for Social Content 4.2 Semi-supervised Learning : Hidden Markov models, K-Nearest Neighbouring 4.3 Sentiment Analysis over Social Media

	Unit 5 Social Media Mining Techniques 5.1 Content-based Recommendation, 5.2 Collaborative Filtering Recommendation, 5.3 Social Network Analysis, 5.4 Detecting Community Structure in Networks, the Evolution of Social Networks **Unit 6 Applied Social Data Analytics** 4.1 Recommendation Systems 4.2 Social Network Analysis using Graph, Random Walks 4.3 Sentiment Analysis 4.4 Community identification and link prediction **Unit 7 Mining Twitter: Exploring Trending Topics** 7.1 Exploring Twitter's API 7.1.1 Fundamental Twitter Terminology 7.1.2 Creating a Twitter API Connection 7.1.3 Exploring Trending Topics 7.1.4 Searching for Tweets 7.2 Data Analysis 7.2.1 Extracting Tweet Entities 7.2.2 Analyzing Tweets and Tweet Entities with Frequency Analysis 7.2.3 Computing the Lexical Diversity of Tweets 7.2.4 Examining Patterns in Retweets 7.2.5 Visualizing Frequency Data with Histograms **Unit 8 Mining GitHub: Software Collaboration Habits and Building Interest Graph** 8.1 Exploring GitHub's API 8.1.1 Creating a GitHub API Connection 8.1.2 Making GitHub API Requests 8.2 Modeling Data with Property Graphs 8.3 Analyzing GitHub Interest Graphs 8.3.1 Seeding an Interest Graph 8.3.2 Computing Graph Centrality Measures 8.3.3 Extending the Interest Graph with "Follows" Edges for Users 8.3.4 Using Nodes as Pivots for More Efficient Queries 8.3.5 Visualizing Interest Graphs

Reference Bookss	1. Mining the Social Web: Data Mining Facebook, Twitter, Linkedin, Google+, Github, and More, 2nd Edition, Matthew A. Russell. O'Reilly Media, 2013. 2. Jennifer Golbeck, Analyzing the social web, Morgan Kaufmann, 2013. 3. Charu Aggarwal (ed.), Social Network Data Analytics, Springer, 2011. 4. Borko Furht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010. 5.Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011. 6. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009. 7. Charu C. Aggarwal, "Social Network Data Analytics", Springer
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	70% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 30% assessment is based on semester end written examination

SEC-3-5: Game Development

Course Code	
Course Title	**Game Development**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Purpose of Course	The goals of this course are to provide introductions to event driven programming, game engine scripting, game engine class structures,learning to plan and to report on a significant programming project, learn to work in programming in teams, and learn to use standard game development environments, in particular the Unity3d development platform.
Course Objective	• To learn the ability to design and develop 2D games. • To learn the ability to design and develop 3D games. • To implement the game design and development process.
Prerequisite	Basics of Logic and Reasoning and C# Programming
Course Out come	After completion of this course, the student will be capable to develop 2D and 3D games using C# Unity Framework.
Course Content	**Unit 1 Introduction to Game Engines and Unity Development Environment** 1.1 Game Engine Concepts 1.2 Development Tools 1.3 IDE basics : Project View, Inspector, Toolbar, Scene View, Game View, Animation View, 1.4 Basic Unity Concepts 1.5 Sprites **Unit 2 Basics of Game Development** 2.1 Game Design Strategies 2.2 Game Requirements 2.3 Game Mechanics 2.4 Storytelling and Progression 2.5 Design Documents **Unit 3 Programming Practices for Game Development** 3.1 Introduction to Scripting, Coding Fundamentals, Loops, Functions 3.2 Simple Movement and Input 3.3 Primitive Data and Math 3.4 Decisions and Flow Control 3.5 Organizing Game Objects **Unit 4 Animation in Unity** 4.1 Animation API 4.2 Animation Class 4.3 Creating the Animation State Manager

	4.4 Creating Animation inside Unity 4.5 Adding Animation Events **Unit 5 Understanding and Managing 3D coordinate space** 5.1 Begin the project: place objects in the scene 5.2 The scenery: floor, outer walls, inner walls 5.3 Lights and cameras 5.4 Understanding Collision and Rigid bodies 5.5 Local vs. Global coordinate space **Unit 6 Using Triggers and Creating Environment Interaction** 6.1 Triggers and Collisions 6.2 Setting Up a basic Trigger Object 6.3 Setting Up other kinds of Trigger 6.4 Completed Scripts **Unit 7 Game Design and Multimedia Effects** 7.1 Virtual Worlds 7.2 Scrolling Game, Animation and Sound Effects 7.3 Advanced Game Physics 7.4 Multiple Scenes 7.5 AI and Games **Unit 8 Publishing Games** 8.1 Splash Screens, Credit Scenes and Icons 8.2 Publishing to PC, Mac and Linux Computers 8.3 Publishing to Smartphones 8.4 Publishing to Game Consoles Computing Ethics and Society
Reference Bookss	1. Game Development with Unity, Michelle Menard, Delmar Cengage Learning 2. Unity in Action, Joseph Hocking, Manning Publication 3. Unity Game Development Cookbook, Paris Buttfield–addis, Jonathon Manning , Tim Nugent Orelly Publication 4. Developing 2D Games with Unity: Independent Game Programming with C#,Jared Halpern Apress Publication 5. Pro Unity Game Development with C#, Alan Thorn, Apress Publication
Teaching Methodology	The course is composed of readings, assignments and a class project.
Evaluation Method	70% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 30% assessment is based on semester end written examination
Reference Links:	https://www.csforallteachers.org/system/files/Unity_Game_Programming_Planner_Syllabus.pdf https://docs.unity3d.com/Manual/index.html https://novicedock.com/learn/computer-science/unity-game-engine https://www.coursera.org/specializations/game-design-and-development https://learn.canvas.net/courses/3/assignments/syllabus http://www.cs.kent.edu/~ruttan/GameProg/

DSE-3-1: Big Data Analytics

Course Code	
Course Title	**Big Data Analytics**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Purpose of Course	The purpose of the course is to make students capable of fundamentals of statistics, mathematics and python programming with advanced libraries.
Course Objective	• To learn about fundamental of big data analytics. • To learn python programming with advanced libraries for implementing big data projects.
Prerequisite	Basics of Data Science and Python Programming
Course Out come	After completion of this course, the student will be capable to understand Big Data platforms, architecture, concepts of map reduce and parallel programming with Spark.
Course Content	**Unit 1 Introduction to Big Data Platform and Frameworks** 1.1 Challenges of Conventional Systems, 1.2 Intelligent Data Analysis, Nature of Data, 1.3 Analytic Processes and Tools, Analysis vs Reporting, 1.4 Modern Data Analytic Tools 1.5 Technology Stack of Big Data **Unit 2 The Big Data Technology Landscape** 2.1 Applications on Big Data Using Pig and Hive, 2.2 Data Processing Operators in Pig, Hive Services, HiveQL, 2.3 Querying Data in Hive, Fundamentals of HBase and ZooKeeper, 2.4 Visualizations,Visual Data Analysis Techniques 2.5 Interaction Techniques, Systems and Applications **Unit 3 Map Reduce Fundamentals** 3.1 The MapReduce Framework; 3.2 Uses of MapReduce; 3.3 Storing Data in Hadoop : Introduction of HDFS, Architecture, HDFC Files, File system types, commands, 3.4 org.apache.hadoop.io package, HDF, HDFS High Availability 3.5 Techniques to Optimize MapReduce Jobs **Unit 4 Hbase Fundamentals** 4.1 Introducing HBase, Architecture, 4.2 Storing Big Data with HBase , Interacting with the Hadoop Ecosystem 4.3 HBase in Operations Programming with HBase 4.4 Installation, Combining HBase and HDFS

	Unit 5 Parallel Programming with Spark 5.1 Components of the Spark unified stack, 5.2 Resilient Distributed Dataset (RDD), 5.3Scala and Python overview, **Unit 6 Spark application programming** 6.1 Initialize Spark with the various programming languages, 6.2 Create and run a Spark standalone application, 6.3 Introduction to Spark libraries -Understand and use the various Spark libraries, 6.4 Sliding Window Analytics, 6.5 Machine Learning with Spark **Unit 7 Big Data Application Management** 7.1 Design of zookeeper, 7.2 CQL cassendrea query language, 7.3 Kafaka for streaming and real time data management, 7.4 Parameter servers, Page Rank algorithm in Bigdata, Spark and GraphX 7.5 Query Engine for managing Big Data **Unit 8 Bigdata Case Studies** 8.1 Flight Data Analysis using Spark and GraphX 8.2 Twitter Sentiment Analysis using PYsAPRK
Reference Bookss	1. Learning Spark: Lightning-Fast Big Data Analysis - Holden Karau N Andy Kowinski O'relly Publication 2. Hadoop - The definitative Guide O'relly Publication 3. Spark- The definitative Guide O'relly Publication 4. Kafka The definitative Guide O'relly Publication 5. Big Data, Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization - Dreamtech Publications 6. Advanced Analytics with Spark: Patterns for Learning from Data at Scale, Sandy Ryza O'relly Publication 7. https://towardsdatascience.com/sentiment-analysis-on-streaming-twitter-data-using-spark-structured-streaming-python-fc873684bfe3
Teaching Methodology	The course is composed of readings, assignments and a class project.
Evaluation Method	70% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 30% assessment is based on semester end written examination

DSE-3-2 : Artificial Neural Network and Deep Learning

Course Code	
Course Title	**Artificial Neural Network and Deep Learning**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Purpose of Course	The purpose of the course is to make students capable of implementing concepts , methods and tool related to deep learning.
Course Objective	• To learn about fundamentals of deep learning. • To learn and implement different types of DL models. • To implement and evaluate various case studies of Deep Learning.
Prerequisite	Basics of Python Programming and Basics of Machine Learning
Course Out come	After completion of this course, the student will be capable to develop models and implement deep learning algorithms and models.
Course Content	**Unit 1 Introduction to Deep Learning** 1.1 A review of Machine Learning 1.2 Biological Inspiration 1.3 Artificial Neural Network 1.4 Concept of Deep Learning 1.5 Applications of areas Deep Learning **Unit 2 Foundations of Maths and Technhical Setup with Python** 2.1 Scalars, Vectors, Matrices, Tensors Hyperplanes 2.2 Products, Feature, Solving Systems of Equations 2.3 Hyperparameters and Convergence 2.4 Gradiant Decent 2.5 Evaluation Metrics 2.6 Python Libraries and Setup for DL - GPU, Keras , Tensorflow **Unit 3 Foundations of Neural Networks** 3.1 Anatomy of Neural Network : - Defining ANN in Python - layers and Multilayer Perceptron, weights, bias, Activation Function, Loss function, Epochs 3.2 Linear threshold units. Perceptrons: representational limitation and gradient descent training. **Unit 4 Artificial Neural Networks and its Types** 4.1 Types of ANN, Feed Forward Neural Network, Backpropagation Neural Network, Error calculation in ANN 4.2 Input Layer, Output Layer, Hidden Layers of Deep Neural

	Network 4.3 Classifying movie reviews using ANN **Unit 5 Convolutional Neural Networks** 5.1 Neurons in Human Vision 5.2 Filters and Feature Maps 5.3 Full Description of the Convolutional Layer Max Pooling 5.4 Full Architectural Description of Convolution Networks 5.5 MNIST with Convolutional Networks 5.6 Accelerating Training with Batch Normalization 5.7 Visualizing Learning in Convolutional Networks 5.8 Learning Convolutional Filters for Other Problem Domains **Unit 6 Deep Learning for Text and Sequences** 6.1 Working with text data - one hot encoding, word embedding 6.2 Understanding Recurrent and Recursive Neural Networks 6.3 Feature Reduction/Dimensionality Reduction 6.4 Recurrent Neural Networks and Implementation **Unit 7 RNN for Language Models and Sequences** 7.1 Language Models with RNN 7.2 Named Entity Recognition, 7.3 Machine Translation, Parsing, Sentiment Analysis, Speech Recognition 7.4 Introduction to LSTM and GRU **Unit 8 Advanced Topics in Deep Learning** 8.1 Attention Mechanisms 8.2 Recurrent Models of Visual Attention 8.3 Application to Image Captioning 8.4 Attention Mechanisms for Machine Translation 8.5 Generative Adversarial Networks (GANs) 8.6 Training a Generative Adversarial Network 8.7Using GANs for Generating Image Data
Reference Bookss	2. Deep Learning with Python, Manning Franci Cohlet 3. Fundamentals of Deep Learning, Orelly, Nikhil Buduma 4. Deep Learning: A Practitioner's Approach, Josh Patterson (Author), Adam Gibson (Author) Orelly 4.Neural Networks and Deep Learning, A Textbook - Springer, Chru C Agrawal 5. Fundamentals of Deep Learning - Nikhil Buduma, O'relly Publications
Teaching Methodology	The course is composed of readings, assignments and a class project.
Evaluation Method	70% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 30% assessment is based on semester end written examination

DSE-3- 3: Fundamentals of Internet of Things

Course Code	
Course Title	Fundamentals of Internet of Things
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Purpose of Course	The purpose of this course is to impart knowledge on Internet of Things (IoT), which relates to the study of sensors, actuators, and controllers, among other Things, IoT applications and examples overview (building automation, transportation, healthcare, industry, etc.)
Course Objective	This course is an introduction for students to IoT. The course also gives students an idea about various components of IoT and explains the working of them. The course also explains the role of embedded systems in IoT ecosystem.
Prerequisite	Fundamental knowledge of Computer Organization, Computer Networks and Internet, Basic programming knowledge
Course Out come	Course Out come After having completed the course the student will gain: 1. Understanding about the architectural detail of IoT 2. Exposure to working with Arduino & Raspbery pi 3. Knowledge about domain specific applications of IoT
Course Content	**Unit 1: Introduction to The Internet of Things** 1.1 The Internet of Things overview - History of IoT, Components of IoT, Characteristics of IoT, About Objects/things in IoT 1.2 Enabling Technologies of IoT 1.2.1 Cloud Computing 1.2.2 Big Data Analytics 1.2.3 Wireless Sensor Networks 1.3 Near Field Communication & RFID **Unit2: IoT Architecture** 2.1 M2M to IoT 2.1.1. Introduction of M2M - Components of M2M 2.1.2. Difference between IoT and M2M 2.2 IoT Reference Model or physical design and logical design of IoT 2.3 IoT Reference Architecture **Unit 3: IoT Application Areas** 3.1 IoT Application Areas 3.1.1. Home Automation

	3.1.2. Smart Cities 3.1.3. Smart Energy & Smart Grid 3.1.4. Smart Health 3.1.5. Smart Manufacturing 3.1.6. Smart Agriculture **Unit 4: Arduino** 4.1 Introduction to Arduino 4.2 Flavors of Arduino 4.3 Architecture of Arduino board 4.4 Arduino Toolchain 4.4.1 Installing Arduino Desktop IDE 4.4.2 Installing Board drivers, Configuring board type, uploading the Program **Unit 5 : Raspberry pi** 5.1 About the board 5.2 Installation of Operating System on Raspberry Pi 5.3 Raspbian OS package Installation and updating process. 5.4 Raspberry pi interfaces of Data Transfer 5.5 Reading general purpose Input/Output pin **Unit 6 : Hardware interfacing & programming in Arduino** 6.1 Controlling LED with Arduino 6.2 Interfacing sensors with Arduino 6.3 Working with switches 6.4 Serial data transfer **Unit 7 : Data Driven Application Using RaspberryPi** 7.1 Selecting database for IoT applications 7.2 Capturing data from surrounding and storing on cloud **Unit 8 : IoT and Security Concerns** 8.1 Types of security attacks 8.2 Security risk mitigation
Reference Books	1. IoT & Applications I.A. Dhotre Technical Publication 2. Designing the Internet of Things Adrian McEwen and Cassimally Wiley 3. The Internet of Things Connection objects to web Edited by Hakima Chauchi Wiley 4. Introduction to Embedded System -By Shibu K V , McGrawHill 5. Getting Started with Internet of Things –By Cuno Pfister, O'Reilly 6. Learning Internet of Things-By Peter Waher , Packt Publication 7. Internet of Things : A Hands on Approach – By Arshdip Bahga and Vijay Madisetti

	8. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press) 9. Raspberry Pi User Guide –By Eben Upton and Garath Halfacree, Wiley 10. Raspberry Pi for Dummies , Wiley 11. Raspberry Pi IoT in C -By Harry Fairhead, I/O Press
Teaching Methodology	The course is composed of Lectures, assignments and a group project.
Evaluation Method	70% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 30% assessment is based on semester end written examination

DSE-3-4: Cyber Law and Practices

Course Code	
Course Title	**Cyber Law and Practices**
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Purpose of Course	To make students aware about provisions of various laws in IT ACT and its amendments.
Course Objective	Various frauds are taking place in different domains frequently. The course is specifically designed to provide knowledge of provisions of various laws and acts available in IT act 2000 and its amendments.
Prerequisite	Basic knowledge of cyber security.
Course Out come	At the end of the course it will make student enable to have knowledge of provision and availability of various act and laws available to fight against frauds and crimes.
Course Content	**Unit 1. Introduction to Cyber law** 1.1. Introduction to cyber law 1.2. Challenges to laws 1.2.1. Technology-neutral and technology-based laws 1.2.2. Regulation versus freedom on the internet 1.2.3. Internet crime different from other technology crimes 1.3. Adjudication 1.3.1. Adjudicating officer 1.3.2. Cyber regulations appellate tribunal **Unit 2 IT Act 2000** 2.1 Overview of IT Act 2000 and its amendments 2.2 Critiques of the I.T. Act 2.3 Territorial effects of IT Act 2.4 Digital signatures 2.4.1 Controller of certifying authorities 2.4.2 License to issue digital signature certificates 2.4.3 Legal recognition of digital signatures **Unit 3 Offences and investigation and penalties under the IT Act** 3.1 Offences 3.2 Investigation 3.3 Penalties 3.4 Liability of network service provider 3.5 Amendments to certain statutes 3.5.1 Amendments to the Indian penal code, 1860 3.5.2 Amendments to the Indian evidence act, 1872

Unit 4 E-governance

4.1 Legal recognition and retention of electronic records
4.2 Use of electronic records and digital signatures in Government and its agencies
4.3 United nations commission on international trade development and law
4.4 World Trade and world intellectual property organization

Unit 5 Telecom and internet policy for data transmission and security

4.1 Broadband policy
4.2 Policy for .IN internet domain name
4.3 Guidelines for setting up of international gateways for internet
4.4 Policy guidelines on website development, hosting and Maintenance
4.5 Information technology Security Guidelines
4.6 SEBI guidelines on internet-based trading and services
4.7 Guidelines on internet-based e commerce and m commerce based services

Unit 6 Indian law

6.1 Law for cyber stalking
6.2 Law for digital forgery
6.3 Law for online gambling
6.4 Law for online sale of illegal articles
6.5 Law for cyber pornography

Unit 7 Jurisdiction in Cyberspace

6.1 Theories of jurisdiction in criminal cases
6.2 General jurisdiction in computer crimes
6.3 Application of 'Effects' doctrine in computer crimes
6.4 Convention on cyber crime – council of Europe

Unit 8 Online Dispute Resolution - ODR

8.1 Functioning of the Online Dispute Resolution (ODR) system
8.2 Kinds of disputes handled in an ODR environment
8.3 Communication modes in ODR
8.3.1 E-mail
8.3.2 Discussion boards
8.3.3 Instant messaging
8.3.4 Audio conferencing
8.3.5 Video conferencing
8.4 Types of ODR
8.4.1 Blind bidding or blind negotiation
8.4.2 Online negotiation
8.4.3 Online negotiation-cum-mediation

	8.4.4 Document / E-mail arbitration for disputes arising from e-commerce transactions 8.4.5 Online arbitration through video-conferencing. 8.4.6 Peer jury and panel jury 8.5 Generating E-confidence – disclosure-based approach 8.6 Legal concerns in ODR
Reference Books	1. Investigating Cyber Law and Cyber Ethics: Issues, Impacts and Practices by Alfreda Dudley, James Braman, Giovanni Vincenti 2. Cyber Laws: A Guide to Cyber Laws, Information Technology, Computer Software, Intellectual Property Rights, E-commerce, Taxation, Privacy, Etc. Along with Policies, Guidelines and Agreements by Yatindra singh 3. Cyber Law in India by Talat Fatima 4. Regulation of Cyberspace – MIR-12 by IGNOU 5. Cyber Law 3.0: An Exhaustive Section Wise Commentary on The Information Technology Act Along with Rules, Regulations, Policies, Notifications Etc by Pawan Duggal
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	70% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 30% assessment is based on semester end written examination

Practical

Course Code	
Course Title	Practical
Credit	8
Teaching per Week	16 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	-
Purpose of Course	The purpose of the course is to make students capable of implementing concepts, methods, tools and techniques learnt in courses of semester 3.
Course Objective	The objective of these course is to enable students to learn practical implementation of DSC-5, DSC-6, SEC-3 and DSE-3.
Pr-requisite	As per theory papers of semester -3
Course Out come	After completion of this course, the student will be capable of performing practical application of subjects given in semester -3.
Course Content	The students will be required to carry out practical on DSC-5, DSC-6, SEC-3 and DSE-3 using the methods and tools discussed there in. A Journal must be prepared for the practical work done.
Reference Book	.As per paper DSC-5, DSC-6, SEC-3 and DSE-3.
Teaching Methodology	Lab Work
Evaluation Method	70% Internal assessment is based on Practical attendance, Problem Solving, internal examination etc. 30% assessment is based practical examination at the end of semester.