SARVAJANIK UNIVERSITY
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Faculty of Science

Shree Ramkrishna Institute of Computer Education & Applied Sciences, Surat

M.Sc. Information Technology

SEMESTER- 2

DSC-3 Mobile Application Development – 1

Course Code	
Course Title	Mobile Application Development – 1
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 introduce the most demanding android open source technology
Course Objective	1. To make students understand advanced concepts of mobile app technology. 2. To make students understand various inbuilt features of android. 3. To make students understand the android design essentials. 4. To make students understand android user interface design basics .
Prerequisite	Pre-requisite Fundamentals of web technologies and fundamentals related to mobile OS.
Course Out come	Students will have knowledge about android which is widely used Mobile OS and open source technology and its concepts. Various features of android like Application Design Essentials, User Interface Design Essentials, Use of Common Android APIs, data storage using SQLite and Firebase and deploying Android application.
Course Content	**Unit 1: Introduction to android and it's tool chain** 1.1 Architecture Of Android OS 1.2 Android Development Tools 1.2.1. Android SDK and SDK Manager 1.2.2. The Android Virtual Device, Emulator 1.2.3. Dalvik Debug Monitor Service (DDMS) 1.2.4. Android Debug Bridge (ADB) **Unit 2: Android - Key Components** 2.1 Components Of Android Application - Activities, Services, Broadcast Receivers, Content Providers 2.2 Directory Structure of Android Application 2.2.1. AndroidManifest.xml 2.2.2. Layouts & Drawable Resources 2.2.3 Activity Java file 2.2.4 Gradle **Unit3: Layout and Advanced UI Design** 3.1. Layouts and its attributes - Linear, Relative, Constraint 3.2. Scrollview 3.3. Webview 3.4. Seekbar, Rating bar 3.5. Recyclerview 3.6. Alert Dialog **Unit 4: Navigating across Application**

	4.1. Intent and Intent Filters 4.2. Menus - context, pop-up, options 4.3. Tab layout 4.4. Navigation Drawer 4.5. Linkify **Unit-5: Using Shared preferences** 5.1 Purpose of Shared Preferences 5.2 Shared Preference Modes 5.3 Writing to shared Preferences 5.4 Methods of editor class 5.5 Reading from Shared Preference **Unit-6: Preserving and Saving data in Local Database** 6.1 Introduction to SQLite 6.2 SqliteOpenHelper Class 6.3 SQlite Methods - ExecSQL, Rawquery, Insert, Update, Delete **Unit 7: Handling Data with Firebase** 7.1 Introduction to Firebase 7.2 Firebase - Environmental Setup 7.3 Writing Data to the Firebase 7.4 Reading data **Unit 8: Working with other Resources** 8.1 Geocoding and reverse Geocoding 8.2 Audio, Video and Using the Camera 8.2.1. Playing and recording Audio and Video 8.2.2. Working with the Camera 8.3 Push Notification
Reference Bookss	1. Professional Android 4 Application Development Reto Meier, WROX Publication-2015 2. Android for Programmers-An App Driven Approach, Deitel, Deitel, Deitel and Morgano, Pearson Publication-2012 3. Android Programming Unleashed, Harwani, Pearson Publication-2013 4. Professional Android Programming-with MONO McClure, Blevins, Croft, Dick and Hardy, Wiley India-2012 5. Android application development for java programmer, James C Sheusi, Cenage Learning-2013 6. Android Essentials, Chris Haseman, Apress Publication, 2009 7. Beginning Android, Mark L Murphy, Wiley India Pvt Ltd, 2009 Pro Android, Sayed Y Hashimi and Satya Komatineni, Wiley India Pvt Ltd, APress-2009
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-4 Web Programming - 2

Course Code	
Course Title	**Web Programming - 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	To provide comprehensive knowledge about JavaScript-based framework built on Google Chrome's JavaScript V8 Engine
Course Objective	To provide knowledge on how to develop I/O intensive web applications like video streaming sites, single-page applications, and other web applications using Node.js framework
Prerequisite	Basic understanding of JavaScript, HTML, CSS and AJAX
Course Out come	After completing the course the student will gain: • Understanding of Node.js Environment • Knowledge of Node Modules • Technical know-hows of Full Stack Node.js based development • Application of Node.js web development of real life application
Course Content	**Unit 1: Introduction Node.js** 1.1 Features and Applications 1 1.1 Installing Node, Node Hosting Environments 1.1.2 Node Building Blocks- Global and Process objects, buffers, Typed arrays and Strings, Streams, Callbacks and Asynchronous, Event Handling- Event Queue, Event Emitter, Event Loop and Timers, Nested Callback 1.2 Exception Handling. 1.3 REPL Terminal **Unit 2: Node Modules and Node Package Manager (NPM)** 2.1 Overview of Node Module System 2.2 Overview of Node Package Manager 2.3 Overview of Node Version Manager 2.4 Creating and Publishing Node Modules 2.5 Node Modules-Async, Commander and Underscore, OAuth 2.6 Overview of Other Utility Modules **Unit 3: Node with the Local System and the Web** 3.1 Streams and Pipes 3.2 Node and the File System- The fs.Stats class, The File System Watcher, File Read and Write, Directory access and Maintenance, File Streams 3.3 Resource Access with Path

	Unit 4: Node and Web Application 4.1 The HTTP Module: Server and Client using APACHE to proxy a Node Application Query String Parsing and DNS Resolution 4.2 Routing in NodeJS 4.3 Routing and Callback function **Unit 5: NodeJS and MongoDB** 5.1 NoSQL Database MongoDB 5.2 MongoDB Objects 5.3 Working with MongoDB-writing data, querying, Indexes, MapReduce **Unit 6: Full-Stack Node development** 6.1 The Express Application Framework 6.2 Express Supportive Modules - Body-parser, Method Override 6.3 Template Engines in NodeJS 6.4 Integrating NodeJS and MongoDB 6.5 NODE.JS RESTful API **Unit 7: Event Management in NodeJS** 7.1 Event Class 7.2 EventEmitter and Methods 7.3 EventListner and EventHandler in NodeJS 7.4 Asynchronus Event Management **Unit 8: Node in New Environment** 8.1 Next Generation NodeJS Framework - Koa 8.2 Working of Koa 8.3 NodeJS and IoT 8.4 Node and Adruino 8.5 Node and Raspberry Pi
Reference Books	Learning Node Moving to the server side Shelley Powers O'Relly SPD Publication 2. Buliding Node Applications with MongoDB and Backbone Mike Wilson O'Relly SPD Publication 3. GEO, CouchDB & NodeJS Mick Thompson O'Relly SPD Publication 4. Web Development with Node and Express, Ethan Brown , O'Relly Publication 5. Node.js in Action, Alex Young, Bradley Meck, Mike Cantelon, Tim Oxley , Marc Harter, T.J. Holowaychuk, Nathan Rajlich
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-2 Advanced Cloud Programming

Course Code	
Course Title	Advanced Cloud Computing
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 establish foundation of micro service architecture technologies and cloud computing
Course Objective	● To develop and deploy Microservices for cloud ● To understand Amazon cloud services, Google cloud services and Azure cloud services ● To implement micro services with DevOps ● To follow the DevOps practices for software development
Pr-requisite	Fundamental knowledge of software engineering, programming, networking, internet and types of Information
Course Out come	After completion of the course, a student should be able to: ● Achieve containerization using Docker ● Develop the Microservices for cloud and deploy them on cloud. ● Thoroughly build the applications in the DevOps way.
Course Content	**Unit 1 Fundamentals of Cloud Computing** 1.1 Evolution of Cloud Computing 1.2 Cloud characteristics and challenges 1.3 Cloud Computing Essentials 1.4 Cloud Computing Architectural Framework 1.5 Cloud Deployment Models **Unit 2 Virtualization and Containerization** 2.1 Virtualization in Cloud Computing 2.2 Parallelization in Cloud Computing 2.3 Introduction to Containerization 2.3.1 Concept of Containerization 2.3.2 Need of Containerization 2.3.3 Containerization and Virtualization **Unit 3 Cloud Service Models & Cloud Based Systems** 3.1 Infrastructure as a Service(IaaS) 3.1.1 Server virtualization 3.1.2 Storage virtualization 3.1.3 Network virtualization 3.2 Platform as a Service(PaaS) 3.2.1 Azure 3.2.2 GooleAppEng 3.2.3 Hadoop 3.2.4 SalesForce 3.3 Software as a Service (SaaS)

	3.3.1 Cloud services 3.3.2 Web portal 3.3.3 Web OS **Unit 4: Cloud Infrastructure and Architectures** 4.1 Cloud Computing Stack - Composability, Infrastructure, Platforms, Virtual Applications, Communication Protocols, Applications 4.2 Cloud Based Storage 4.2.1 Provisioning Cloud Storage - Unmanaged and Managed cloud storage, creating cloud storage systems, virtual storage containers 4.3 Service Level Agreement 4.4 Cloud Security Concepts 4.5 Inter Cloud Communication **Unit 5 Evolution of Micro Services Architecture (MSA)** 5.1 Current architectural styles 5.1.1 Monolithic architecture 5.1.2 Service oriented architecture 5.1.3 Micro service architecture 5.2 Decomposition 5.2.1 Decompose by business capability 5.2.2 Decompose by subdomain 5.2.3 Self-contained Service 5.2.3 Service per team **Unit 6 MSA – Data and Transaction Aspects** 6.1 Data management 6.1.1 Database per Service 6.1.2 Shared database 6.1.3 Saga 6.1.4 API Composition 6.1.5 CQRS 6.1.6 Domain event 6.1.7 Event sourcing 6.2 Transactional messaging 6.2.1 Transactional outbox 6.2.2 Transaction log tailing 6.2.3 Polling publisher 6.3 Fault Tolerance using Circuit Breaker Pattern **Unit 7 Micro Services with DevOps** 7.1 Embracing DevOps in MSA 7.2 Ecology of MSA 7.3 Micro Servers 7.4 Rest API 7.5 Packaging Micro Services Applications 7.6 Containerization with Docker 7.7 Docker Client Commands 7.8 Data Caching for Micro Services 7.9 Container Orchestration and Load Balancing

	7.10 Security Propagation across Micro Services **Unit 8 Realizing MSA based Application** 8.1 Micro Profile based Application for MSA 8.2 Service Discovery API 8.3 Deploying MSA based Applications on cloud.
Reference Book	1. Pro Newcomer & Lomow, "Understanding SOA with Web Services", Pearson Education, 2007 2. Bieberstein,Bose,Fiammante,Jones and Shah "Service-Oriented Architecture(SOA) Compass", Pearson Education, 2010 3. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005. 4. Thomas Erl, "SOA: Principles of Service Design ",Pearson Education, 2009 5. Pulier and Taylor, "Understanding Enterprise SOA", DreamTech, 2008 6. Michael HAvey, "SOA cookbook", SPD, 2008 7. Cloud Computing: Principles and Paradigms - R. Buyya et al-Wiley 2010 8. Cloud Computing Bible - Sosinsky - Wiley - India,2011 9. Cloud Computing Second Edition Dr. Kumar Saurabh - Wiley - India, 2012 10. Building Microservices Paperbackby Sam Newman, SPD Press, 2017 11. Microservices for Java EE Architects: Addendum for The Java EE Architect's Handbook by Derek C. Ashmore, 2017 12. Kubernetes Microservices with Docker by Deepak Vohra,Apress Publication, 2018 13. Docker Quick Start Guide: Learn Docker like a boss, and finally own your applications by Earl Waud, PACKT publications, 2018 14. Apache ZooKeeper Essentials by Saurav Haloi, PACKT publications, 2015 15. Hazelcast A Complete Guide - 2019 Edition by Gerardus Blokdyk publication: 5STARCooks, 2019 16. Microservices Patterns: With examples in Java by Chris Richardson, Publisher: Manning Publications, 2018 17. Microservices and Containers 1st Edition by Parminder Singh, Kocher Publisher - Addison-Wesley Professional, 2018 18. Hands-On Microservices with Kubernetes: Build, deploy, and manage scalable microservices on Kubernetes, by Gigi Sayfan,Packt Publications
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 end semester written examination

DSC-2-1: Cyber Security and Forensics-2

Course Code	
Course Title	Cyber Security and Computer Forensics-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	Conceptualize the students with the concepts of computer forensics methodology
Course Objective	Familiarization with different objectives associated with different forensic techniques. Different stages of forensic investigation process life cycle can focus on broad idea of the forensic process.
Prerequisite	Basic knowledge of Cyber security, Information security, computer network, operating systems and hardware mechanism of IT peripherals.
Course Out come	1. Get familiar with different stages of forensic life cycle. 2. Get aware about different methodologies of forensic investigation process. 3. Get equipped with different forensic investing tool.
Couse Description	Basic terminology associated with forensic investigation process, types of forensic technology, data recovery, evidence collection and data seizure, duplication and preservation of digital evidence, computer image verification and authentication, reconstructing past event to collect evidence. Moreover forensic investigation process of computer, network, e mail, android, i-phone, printer, scanner, pda etc. is covered as subject content.
Course Content	**Unit 1: Mobile application Security** 1.1 Issues in mobile devices 1.2 Securing mobile app development 1.3 Bluetooth & SMS security 1.4 Android, IOS , Windows Mobile security 1.5 Enterprise security on mobile OS 1.6 Mobile Malware's 1.7 Mobile resource privacy concern **Unit 2: Cloud storage security** 2.1 Security planning 2.2 Security boundaries 2.3 Key points to CSA Model 2.4 Understanding data security 2.5 Working of brokered cloud storage access system 2.6 Managing cloud operations

Unit 3: Practical's & Case Studies

3.1 Various commands: ping, tracert, ipconfig, netstat, netstat, arp, nbtstat, hostname, tracert, nslookup, route, pathping
3.2 Using vmware
3.3 Configuring and using firewall
3.4 SQL Injection examples
3.5 DOS Attack examples

Unit 4: Forensic investigation tools

1.1. E-discovery
1.2. EDRM Models
1.3. Autopsy
1.4. Encrypted disk detector
1.5. Network miner
1.6. Ram capture
1.7. Splunk
1.8. FAW
1.9. Xplico

Unit 5: Windows forensic

5.1 Volatile and non volatile data collection
5.2 Registry analysis
5.3 Browser analysis
5.4 File system and meta data analysis
5.5 Event log analysis
5.6 Crash dump analysis

Unit 6: Network forensic

6.1 Understanding protocols with wireshark
6.2 Packet capture using wireshark and tcpdump
6.3 Packet filtering
6.4 Investigating network traffic
6.5 Network component analysis
6.6 Router forensic
6.7 Network log analysis

Unit 7: Wireless network forensic

7.1 Forensic analysis of hand held devices

	7.2 Proliferation and diversity of hand held devices 7.3 Personal security and RFID 7.4 GPS Jamming 7.5 Capturing wireless traffic 7.6 Wearable device forensic **Unit 8: Cloud forensics** 8.1 Introduction to cloud forensic 8.2 Challenges faced by CSP due to international law enforcement 8.3 Cloud storage forensic framework 8.4 Google drive and Drop box analysis 8.5 Case study
Reference Bookss	1. Computer forensic by John R. Vacca, Firewall media, 2. Computer forensic, Nina godbole, sunit belapure, wiley 3. Wireless crime and forensic investigation, Gregory kipper, Auerbach publication (Tallor and Francis group) 4. Computer forensic and cyber crime 3rd edition, by Marjie Britz, Pearson 5. Computer forensic investigation network intrusion and cyber crime EC Council, course technology
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-2-2: UI/UX development

Course Code	
Course Title	**UI/UX 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	This course is make relevant & up to-date in the digital world with the deep understanding of *UX*. Learn to create persuasive user experience & get an edge over the others. It is design-centric approach to user interface and user experience design, and offers practical, skill-based instruction centered around a visual communications perspective.
Course Objective	UI design is about the look and feel of the website or application. UX design improves the overall experience of the users when they interact with the website or application.
Prerequisite	Basic Knowledge of software designing & prototyping is required.
Course Out come	On successful completion of this subject, a student will be able to: • Describe aspects of user interaction and cognition as they relate to UI/UX. • Explain the role and importance of Standards, Technologies, and Guidelines in the UX process and UI process. • Select and apply appropriate methods for analysing a design • Select and apply the relevant descriptive statistical tests associated with UX . • Analyse problems associated with different designs and suggests solutions for their resolution.
Course Description:	The UI/UX Design brings a design-centric approach to user interface and user experience design, and offers practical, skill-based instruction centered around a visual communications perspective, rather than on one focused on marketing or programming alone. In this sequence of courses, summarize and demonstrate different stages of the UI/UX development process, from user research to defining a project's strategy, scope, and information architecture, to developing sitemaps and wireframes. Students will learn conventions in UX design and apply them to create effective and compelling screen-based experiences for websites or apps.

Course Content	**Unit 1: UI/UX Overview** 1.1 Introduction to UI/UX 1.2 Good vs. Bad UX 1.3 UX Vs. UI
	Unit 2: Design Thinking 2.1 Introduction to user experience design process 2.2 Carrying out user research and report findings 2.3 Mapping user journey and experience maps 2.4 Creating information architecture using card sorting
	Unit 3: Design Sprint 3.1 Define Design Sprint 3.2 Phases of Design Sprint 3.3 Requirement to run a Design Sprint 3.4 Team Design Sprint
	Unit 4: User Research 4.1 UX research sub-sets 4.2 How to identify stakeholders 4.2 Defining Stakeholders 4.3 How to identify user needs 4.4 Principles of UX research 4.5 Innovation Management 4.6 Culture and Design 4.7 Sustainable Design 4.8 Applied Ergonomics [Human factor principles in UX] 4.9 Research with Empathy in mind
	Unit 5: UI Design Fundamentals 5.1 UI principles & process 5.2 Typography and importance of content design 5.3 Accessibility 5.4 Iconography 5.5 Graphics 5.6 designing with development in mind
	Unit 6: User Testing 6.1. Usability testing remotely & in person 6.2. Steps to perform usability testing 6.3. A/B testing 6.4. looking into analytics
	Unit 7: User Manual Designing 7.1 User persona's [Structuring content] 7.2 User Journey maps

	7.3 Making a Decision 7.3 User Stories 7.4 4-step Sketch 7.5 Low & High fidelity wireframe 7.6 User testing
	Unit 8: Wireframing & Rapid Prototyping 8.1 Notion & Figma Setup 8.2 Figma basics 8.3 Figma prototype 8.4 Figma Layout and Grayscale 8.5 TextColor, Font, icon & graphics 8.6 UI Components 8.7 Responsive Design 8.8 Testing & Refactoring Design 8.9 Creating an impressive portfolio
Reference Bookss	1. UI is Communication By Everett N McKay 2. Simple and Usable Web, Mobile, and Interaction Design By Giles Colborne 3. Designing Interfaces , By Jenifer Tidwell, O'Reilly publication 4. About Face: The Essentials of Interaction Design ,By Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel 5. The UX Book , By Rex Hartson and Pardha Pyla 6. Smashing UX Design ,By Jesmond Allen and James Chudley
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-2-3: Research in computing

Course Code	
Course Title	**Research in Computing**
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 machine learning
Course Objective	• To learn about fundamentals of research in computer science. • To learn about research work, research writing and emerging research areas of computer science.
Prerequisite	Basics of Computer Science, Mathematics and Statistics
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 Research** 1.1 Research: a way of thinking 1.2 Types of Research 1.3 Research Problem 1.4 Conducting a research study **Unit 2: Literature Review and Hypotheses** 2.1 How to review the literature 2.1.1 Searching Literature 2.1.2 Reviewing Literature 2.1.3 Writing about Reviewed Literature 2.2 Definition of hypothesis 2.3 Types and characteristic of Hypothesis **Unit 3: Research Methods and Data Collection** 3.1 Survey Research 3.2 Observation Methods 3.3 Methods of data collection 3.4 Concept of Sampling 3.5 Types of Sampling 3.6 Determination of Sample Size **Unit 4: Data Analysis and Presentation** 4.1 Data gathering, validation, and analysis 4.2 User studies, surveys, and survey tools 4.3 Statistical Modelling 4.4 Mathematical Modeling 4.5 Performance metrics 4.6 Simulation

	4.7 Presentation and tools **Unit 5: Proposing and Performing Research** 5.1 Types of papers (survey, position, research, etc.) 5.2 Problem identification 5.3 Literature review and citation 5.4 Identifying subjects 5.5 Selecting appropriate methodology 5.6 Assessment and validation **Unit 6: Conduct of Research** 6.1 Ethics 6.2 Plagiarism 6.3 Intellectual property 6.4 Technical writing, formats **Unit 7: Research Domains in Computing** 7.1 Artificial Intelligence 7.2 Data Mining and Data Science 7.3 Machine Learning and Deep Learning 7.4 Computational Linguistic 7.5 Image Processing **Unit 8: Multidisciplinary Research** 8.1 Internet of Things in Medical, Agricultural and Industrial Domains 8.2 Computational Biology : Computational Genomics, Computational Proteomics, Bioinformatics 8.3 Education : Accreditation, Assessment, Pedagogy, Educational Tools 8.4 Molecular Computing : Algorithmic Self-Assembly, Chemical Reaction Networks, DNA Strand Displacement, DNA Sequence Design, Thermodynamic Computing 8.5 Network Science - Complex Networks, Social Networks 8.6 Quantum Computing: Quantum Complexity Theory, Post-Quantum Cryptography, Quantum Error Correcting Codes
Reference Bookss	1. Research Methodology : Methods and Techniques, C.R. Kothari, New Age Publication 2. Qualitative Research: A Guide to Design and Implementation, 4th Edition Sharan B. Merriam, Elizabeth J. Tisdell, Jossey-Bass Publication 3. RESEARCH METHODOLOGY 2nd Edition, R. PANNEERSELVAM, PHI Learning 4. A Guide for New Referees in Theoretical Computer Science, by Ian Parberry. 5. A primer on mathematical writing, by Steven L. Kleiman 6. An Evolution of Computer Science Research, https://www.cs.rpi.edu/research/pdf/12-03.pdf. 7. Association of Computing Machinery Computing and Public Policy Page (including Code of Ethics) 8. Hints on good mathematical writing, by David Goss

	9. How to do Research in the MIT AI Lab, ed. David Chapman 10. How to Present a Paper in Theoretical Computer Science, by Ian Parberry. 11. How to write a thesis in an Experimental area of Computer Science by Doug Comer. 12. J. Zobel, Writing For Computer Science, New York: Springer-Verlag, 1997.
Teaching Methodology	The course is composed of readings, assignments and a class work.
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-2-4: Machine Learning

Course Code	
Course Title	**Machine 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 machine learning
Course Objective	• To learn about fundamentals of machine learning. • To learn and implement different types of ML algorithms. • To implement and evaluate various case studies of Machine Learning.
Prerequisite	Basics of Python Programming and Basics of Data Mining
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 Machine Learning** 1.1 Types of Learning 1.2 Machine Learning 1.3 Types of Problem in ML 1.4 Machine Learning Applications 1.5 New Challenges for ML **Unit 2: Association Learning** 2.1 Concept of Association Rule 2.2 Market-Basket Analysis 2.3 Support and Confidence 2.4 Algorithms 2.4.1 Apriori 2.4.2 FP-Growth **Unit 3: Supervised Learning - Regression** 3.1 Linear Regression 3.2 Polynomial Regression 3.3 Logistic Regression 3.4 Evaluation Metrics for Regression **Unit 4: Supervised Learning - Classification** 4.1 Classification: Examples and Applications NB, SVM. KNN Classifiers 4.2 Decision Trees : C4.5, ID3, Random Forest 4.3 Ensemble Classifiers 4.5 Evaluation Metrics for Classification **Unit 5: Artificial Neural Networks**

	5.1 Neurons and biological motivation and Defining ANN 5.2 Layers and Multilayer Perceptron, weights, bias, Activation Function, Loss function, Epochs 5.3 Linear threshold units. Perceptrons: representational limitation and gradient descent training. 5.4 Types of Neural Network- Feed Forward Neural Network, Backpropagation Neural Network Error calculation in ANN 5.5 Learning in ANN and Learning Rate **Unit 6: Unsupervised Learning** 6.1 Learning from unclassified data. Clustering. 6.2 Hierarchical Aglomerative Clustering, k-means partitional clustering. 6.3 Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labeled and unlabled data. 6.4 Self Organizing Maps 6.5 Hidden Markov Models **Unit 7: Model Validation** 7.1 ML Techniques overview 7.2 Validation Techniques (Cross-Validations) 7.3 Feature Reduction/Dimensionality reduction 7.4 Principal components analysis (Eigen values, Eigen vectors, Orthogonality) 1.5 Generalization, Overfitting, and Underfitting, Relation of Model Complexity to Dataset Size **Unit 8: Advanced Machine Learning Concepts** 8.1 Reinforcement Learning 8.2 Transfer Learning, 8.3 Federated Learning
Reference Bookss	1. AI an Machine Learning, Vinod Chandra SS, Anans Hareendran S. PHI Publication 2. Machine Learning with Python, Abhishek Vijayvargia, BPB Publication 3. Machine Learning Hand-On for Developers and Technical Professionals, Jason Bell, Wiley Publication 4. Machine Learning for Beginners: Learn to Build Machine Learning Systems Using Python , Harsh Bhasin, BPB Publication 5. Machine Learning - Tom M. Mitchell, McgrewHill 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

DSC-2-5: Advanced Python Programming

Course Code	
Course Title	**Advanced Python Programming**
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 advanced computing ◆ To learn python programming with advanced libraries
Prerequisite	Basics of Mathematics and Computer Programming
Course Out come	After completion of this course, the student will be capable to understand fundamental concepts statistics, probability, regression, mathematics and operations of computing using python.
Course Content	**Unit 1: Fast Array Operations with Numpy** 1.1 Creating, Accessing, broadcasting arrays 1.2 Mathematical operations 1.3 Calculating the norm 1.4 Reaching optimal performance with numexpr **Unit 2: Pandas and Advanced Database Operations** 2.1 Pandas fundamentals 2.2 Indexing Series and DataFrame objects 2.3 Database-style operations with Pandas : Mapping and Grouping 2.4 Aggregations and transforms 2.5 Joining 2.6 Graph Plots **Unit 3: MatplotLib for Data Visualization** 3.1 Installation and Setup 3.2 Basic Plots 3.3 Ploting Mutiple Graphs and Subplots 3.4 Embedding Text and Expressions 3.5 Saving the figure in different formats **Unit 4: Seaborn for Data Visualization** 4.1 Importing Datasets and Libraries 4.2 Pie, bar, Scatter, Heatmaps in Seaborn 4.3 Styleing Charts using Seaborn 4.4 Searborn Multipanel and Facet Plots **Unit 5: SciKitLearn and Prediction Models** **5**.1 Binary and Multiclass Classification 5.2 Performance Measures

	5.3 Naive Bays Implementation 5.4 Training and Testing SVM Models 5.5 Training and Testing Decision Tree Models 5.6 Ensemble Learning and Random Forest Models 5.7 Linear and Logistic Regression Implementation **Unit 6: Tensorflow and Deep Learning** 6.1 Tensor Data Structure 6.2 Tensorboard Visualization 6.3 Tensorflow Linear Regression 6.4 Single layer Perceptron using Tensorflow **Unit 7: Flask and Web Application Basics** 7.1 Flask Fundamentals 7.2 Web Application and Page Creation 7.3 Routing in Flask 7.4 HTTP Methods in Flask 7.5 Templates and Static Files **Unit 8: Deploying application using Flask and Heroku** 8.1 Creating the Python Flask Example Application 8.2 Deploying the Application to Heroku 8.3 Using Heroku Pipelines to Implement a Deployment Workflow 8.4 Managing Environment
Reference Bookss	1) Discrete Mathematics - Sujit Chavan, Nandani Sakhare, HImalaya Publishing House 2) Computer Oriented Statistical Techniques - Dinesh Gabhane, Madhuri S. Banker, HImalaya Publishig House 3) Linear Algebra using Python - Archana Jadhav, Nandini Sakhare, Himalya Publishing House 4) Python Data Science FOR Dummies - John Paul Mueller, Luca Massaron - Wiley Publication 5) MatplotLib Cook Book 3.0 By Alexandre Devert Packt Publishing https://github.com/PacktPublishing/Matplotlib-3.0-Cookbook/tree/master/Chapter08 6) Hands On Machine Learning with Scikit Learn and TensorFlow O relly Publication Aurelien Geron https://github.com/yanshengjia/ml-road/blob/master/resources/Hands%20On%20Machine%20Learning%20with%20Scikit%20Learn%20and%20TensorFlow.pdf 7) Data Science for Business, Tom Fawcett, Foster Provost , O'relly Publication 8) Python Data Science Handbook, Jake VanderPlas, O'relly Publication 9) Core Python Programming, Nageshwar Rao, dreamtech press 10) Flask Web Development Miguel Grinberg, O'relly Publication
Teaching Methodology	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

205- Practical

Course Code	205
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 1.
Course Objective	The objective of these course is to enable students to learn practical implementation of DSC-3, DSC-4, SEC-2 and DSE-2.
Pr-requisite	As per theory papers of semester -2
Course Out come	After completion of this course, the student will be capable of performing practical application of subjects given in semester -2.
Course Content	The students will be required to carry out practical on DSC-3, DSC-4, SEC-2 and DSE-2 using the methods and tools discussed there in. A Journal must be prepared for the practical work done.
Reference Book	As per paper DSC-3, DSC-4, SEC-2 and DSE-2.
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.

Semester 3								
Course Code	**Title**	**Teaching Hrs. per week**		**Course Credits**	**University Examination**		**Internal Marks**	**Total Marks**
		Theory	**Practical**	**Marks**	**Duration**	**Marks**		
	DSC-5 : Internet of Things	4		4		30	70	100
	DSC-6 : Game Development	4		4		30	70	100
	SEC-3 Elective-1	4		4		30	70	100
	DSE-3 Elective-2	4		4		30	70	100
	Practical		16	8		140	60	200
		16		24				600

NOTE: Following subjects are listed as elective subjects of semester.

ELECTIVE SUBJECTS

SEC- 3	1. Advanced JavaScript Framework 2. Data Visualization 3. Blockchain Technology 4. Computational Linguistic 5. Social Media Mining and Analytics
DSE - 3	1. Mobile Application Development - 2 2. Bigdata & Analytics 3. Artificial Neural Network and Deep Learning 4. Cyber Law and Practices

Semester 4								
Course Code	**Title**	**Teaching Hrs. per week**		**Course Credits**	**University Examination**		**Internal Marks**	**Total Marks**
		Theory	**Practical**		**Duration**	**Marks**		
401	DSC-7: Project / Dissertation			20		150	350	500
402	DSE-4 Seminar Presentation/Review of published research paper			4		30	70	100
	Total=			24				600