III Semester

Code	Name of the subject	Periods/week		Max Marks		Total Marks	Credits
		Theory	Lab	External	Internal		
MSCS301	INFORMATION SECURITY AND CRYPTOGRAPHY	4	-	75	25	100	4
MSCS302	DATA SCIENCE WITH R	4	-	75	25	100	4
MSCS303	OBJECT ORIENTED SOFTWARE ENGINEERING	4	-	75	25	100	4
MSCS304	ELECTIVE-I	4	-	75	25	100	4
MSCS305	ELECTIVE-II	4	-	75	25	100	4
MSCS306	R LAB	-	3	50	50	100	2
MSCS307	OOSE LAB	-	3	50	50	100	2
MSCS308	MINI PROJECT	-	3	-	50	50	2
					Total	700	24

ELECTIVE-I: SOFTWARE TESTING AND QUALITY ASSURANCE / INTERNET OF THINGS / IMAGE PROCESSING

ELECTIVE-II: CLOUD COMPUTING / SOFT COMPUTING / MOBILE COMPUTING

PSR PV KK PVR BKR DL

MSCS 301: INFORMATION SECURITY AND CRYPTOGRAPHY

Instruction: 4 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 25 Marks	**External: 75 Marks**	**Total: 100 Marks**

UNIT I

Introduction: The need for security-security approaches-principles of security-Plain Text and Cipher Text-substitution and Transposition Techniques-Encryption and Decryption-Symmetric and Asymmetric Cryptography-key range and key size-types of attacks.

Number Theory: Introduction to number theory- Modular Arithmetic, Euclidean algorithm, Euler theorem, Fermat Theorem, Totient Function, Multiplicative and Additive Inverse.

UNIT II

Symmetric Key Cryptographic Algorithms: Algorithm types and modes-overview of symmetric key cryptography-DES-AES-Differential and Linear Cryptanalysis.

Asymmetric Key Cryptographic Algorithms: Overview of asymmetric key cryptography- RSA algorithm-symmetric and asymmetric key cryptography together- Introduction to digital signatures

UNIT III

User Authentication Mechanisms: Introduction-Authentication basics-passwords-authentication tokens-certificate based authentication-biometrics authentication-Hash functions-SHA1.

System Security: Intruders and types of intruders, Viruses and virus types, Related Threats, Introduction to Trusted Systems.

UNIT IV

Internet Security Protocols: Basic concepts-SSL-SHTTP-TSP-SET-SSL versus SET- 3D secure protocol-Electronic money-Email security: PGP, S/MIME.

Network Security: Firewalls: Firewall characteristics and types of firewalls -IP security-Virtual Private Networks.

Text Books:

1. Cryptography and Network security, AtulKahate, Tata McGraw-Hill Pub company Ltd., New Delhi
2. Network Security Essentials Applications and Standards, William Stallings, Pearson Education, New Delhi

Reference Books:

1. Network Security Private Communication in a public world, Charlie Kaufman, Radia Perlman & Mike Speciner, Prentice Hall of India Private Ltd., New Delhi
2. Network Security: The Complete Reference by Roberta Bragg, Mark Phodes - Ousley, Keith Strass berg Tata McGraw-Hill.

PV MCK PVR BLR

MSCS 302: DATA SCIENCE WITH R

Theory	: 4 Hrs/week	Credits	: 4
Int Marks	: 25	Ext Marks	: 75

UNIT - I

Introduction to Data Science- The Data Science process- The roles in a data science project. Stages of a data science project: Defining the goal , Data collection and management Modelling , Model evaluation and critique, Presentation and documentation, Model deployment and maintenance , Setting expectations: Determining lower and upper bounds on model performance

Exploring Data - Using summary statistics to spot problems: Typical problems revealed by data summaries, Spotting problems using graphics and visualization: Visually checking distributions for a single variable, visually checking relationships between two variables

Managing data -Cleaning data, Treating missing values (NAs), Data transformations, Sampling for modelling and validation: Test and training splits, Creating a sample group column, Record grouping, Data provenance

UNIT - II

Modelling Methods - Choosing and evaluating models -Mapping problems to machine learning tasks: Solving classification problems, Solving scoring problems ,Working without known targets, Problem-to-method mapping . Evaluating models: Evaluating classification models, Evaluating scoring models, Evaluating probability models, Evaluating ranking models, Evaluating clustering models. Validating models: Identifying common model problems, Quantifying model soundness, Ensuring model quality

Memorization methods - Building single-variable models: Using categorical features, Using numeric features, Using cross-validation to estimate effects of overfitting .

UNIT - III

Linear and logistic regression -Using linear regression: Understanding linear regression , Building a linear regression model ,Making predictions, Finding relations and extracting advice , Reading the model summary and characterizing coefficient quality , Linear regression takeaways .Using logistic regression: Understanding logistic regression , Building a logistic regression model , Making predictions , Finding relations and extracting advice from logistic models , Reading the model summary and characterizing coefficients.

Unsupervised methods - Cluster analysis: Distances,Preparing the data, Hierarchical clustering with helust(). The k-means algorithm, Assigning new points to clusters.

UNIT - IV

Delivering Results - Documentation and deployment -The buzz dataset, Using knitr to produce milestone documentation , What is knitr? , knitr technical details. Using comments and version control for running documentation : Writing effective comments , Using version control to record history , Using version control to explore your project , Using version control to share work , Deploying models.

Text Books:

1. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.

Reference Books:

1. Jure Leskovec, AnandRajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014.
2. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley & Sons, Inc., 2012.
3. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.
4. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, "Practical Data Science Cookbook", Packt Publishing Ltd., 2014.

PSC PV. MKR PVR BKR DL

MSCS 303: OBJECT ORIENTED SOFTWARE ENGINEERING

Instruction: 3 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 25 Marks	**External: 75 Marks**	**Total: 100 Marks**

UNIT I

Introduction to Object Oriented Software Engineering: Nature of the Software, Types of Software, Software Engineering Activities, Software Quality

Introduction to Object Orientation: Data Abstraction, Inheritance & Polymorphism, Reusability in Software Engineering, Examples: Postal Codes, Geometric Points.

Requirements Engineering: Domain Analysis, Problem Definition and Scope, Types of Requirements, Techniques for Gathering and Analyzing Requirements, Requirement Documents, Reviewing Requirements, Case Studies: GPS based Automobile Navigation System, Simple Chat Instant Messaging System.

UNIT II

Unified Modeling Language & Use Case Modeling: Introduction to UML, Modeling Concepts, Types of UML Diagrams with Examples; User-Centered Design, Characteristics of Users, Developing Use Case Models Of Systems, Use Case Diagram, Use Case Descriptions, The Basics of User Interface Design, Usability Principles.

Class Design and Class Diagrams: Essentials of UML Class Diagrams, Associations And Multiplicity, Generalization, Instance Diagrams, Advanced Features of Class Diagrams, Process of Developing Class Diagrams, Interaction And Behavioural Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component and Deployment Diagrams.

UNIT III

Software Design and Architecture: Design Process, Principles Leading to Good Design, Techniques for Making Good Design Decisions, Good Design Document, Software Architecture, Architectural Patterns: The Multilayer, Client-Server, Broker, Transaction Processing, Pipe & Filter And MVC Architectural Patterns.

Design Patterns: Abstraction-Occurrence, General Hierarchical, Play-Role, Singleton, Observer, Delegation, Adaptor, Façade, Immutable, Read-Only Interface and Proxy Patterns.

UNIT IV

Software Testing: Effective and Efficient Testing, Defects in Ordinary Algorithms, Numerical Algorithms, Timing and Co-ordination, Stress and Unusual Situations, Testing Strategies for Large Systems.

Software Project Management: Introduction to Software Project Management, Activities of Software Project Management, Software Engineering Teams, Software Cost Estimation, Project Scheduling, Tracking And Monitoring.

Software Process Models: Waterfall Model, The Phased Released Model, The Spiral Model, Evolutionary Model, The Concurrent Engineering Model, Rational Unified Process.

Text Book:

1. Object Oriented Software Engineering: Practical Software Development using UML and Java. Timothy C Lethbridge & Robert, Langaneire, Mc Graw Hill

Reference Books:

1. The Unified Modeling Language User Guide. Grady Booch,JamesRumbaugh and Ivar Jacobson. Addison-Wesley.
2. Software Engineering; A Practitioner's Approach. Roger S Pressman.
3. Object-OrientedSoftwareEngineering:UsingUML,Patternsand Java, BerndBrueggeandAllenH.Dutoit,2ndEdition,PearsonEducationAsia.

PSV PV MKK PVR BKR DL

ELECTIVE I
MSCS 304: SOFTWARE TESTING AND QUALITY ASSURANCE

Instruction: 4 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 25 Marks	**External: 75 Marks**	**Total: 100 Marks**

UNIT I

Basic concepts of quality and testing: Quality revolution, Software Quality, Role of testing, Verification and validation, Failure, Error, Fault, and Defect, Objectives of testing, What is a Test Case, Expected Outcome, Testing activities, Test Levels, Sources of information for Test Case selection.

Unit Testing: Unit testing basics, Static Unit testing, Defect prevention, Dynamic unit testing, Mutation Testing, Debugging, Unit testing in extreme programming, Tools for unit testing.

Control flow testing: Outline of Control flow testing, Control flow graph and Paths, Path Selection Criteria: All-path coverage criterion, Statement coverage criterion, Branch coverage criterion, Predicate coverage criterion, Generating test input, test data selection.

UNIT II

Data flow testing: General idea, Data flow anomaly, Data flow graph, Data flow terms, Data flow testing criteria.

Domain testing: Domain error, Testing for domain errors, Sources of domains, Types of domain errors, ON and OFF points, Test selection criterion.

Integration testing: Concept of integration testing, Different types of interfaces and interface errors, System integration techniques: Incremental, Top down, Bottom up, Sandwich and Big Bang, Test plan for system integration, Off-the-shelf component integration.

UNIT III

Software Quality Assurance (SQA) : The uniqueness of SQA, The environments for which SQA methods are developed, what is software, Software errors, faults and failures, classification of the causes of software errors, software quality-definition, SQA -definition and objectives.

Software quality factors: Classification of software requirements into software quality factors: Product operation, product revision, Product transition.

Software quality assurance system: The SQA system-an SQA architecture: Pre-project components, Software project life cycle components, Infrastructure components, Management SQA components.

UNIT IV

CASE tools for software quality: What is a CASE tool? The contribution of CASE tools software product quality, the contribution of CASE tools to improved project management.

Software quality metrics: Objectives of measurement, Classification of quality metrics, Process metrics, Product metrics, Implementation of quality metrics, Limitations of metrics.

Quality management standards: The scope of quality management standards, ISO 9001 and ISO 9000-3, Capability maturity models-CMM and CMMI assessment methodology, The Bootstrap methodology, The SPICE project and the ISO/IEC 15504 software process assessments standard.

Text books:

1. Software Testing and Quality Assurance. Kshirasagar Nail, PriyadarshiTripathy. John Wiley Publication.
2. Software Quality Assurance: From theory to implementation. Daniel Galin. Pearson Adison Wesley Publication.

PSV PV MMC PVR BER DL

ELECTIVE I
MSCS 304 INTERNET OF THINGS

Theory	**: 4 Hrs/week**	**Credits**	**: 4**
Int Marks	**: 25**	**Ext Marks**	**: 75**

UNIT – I

Introduction to Internet of Things: Definition & Characteristics of IoT, Physical Design of IoT Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates Domain Specific IoTs: Home, Cities, Environment, Energy systems, Logistics, Agriculture, Health & Lifestyle

UNIT – II

IOT & M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, I Need for IoT Systems Management, Simple Network Management Protocol (SNMP) , Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG, NETOPEER

UNIT – III

IoT Platforms Design Methodology: IoT Design Methodology, Case Study on IoT System for Weather Monitoring , Motivation for Using Python , IoT Systems - Logical Design using Python ,Installing Python , Python Data Types & Data Structures ,Control Flow , Functions, Modules, Packages , File Handling l, Date/Time Operations , Classes ,Python Packages of Interest for IoT

UNIT – IV

IoT Physical Devices & Endpoints: Raspberry Pi , About the Board , Linux on Raspberry Pi , Raspberry Pi Interfaces , Programming Raspberry Pi with Python , Other IoT Devices, IoT Physical Servers & Cloud Offerings , Introduction to Cloud Storage Models & Communication APIs , WAMP - AutoBahn for IoT , Xively Cloud for IoT , Python Web Application Framework - Django , Designing a RESTful Web API , Amazon Web Services for ,SkyNetIoT Messaging Platform

Text Book:

1.Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

Reference Book:

1. Fundamentals of Python, K.A.Lambert and B.L.Juneja, Cengage Learning, 2012

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ELECTIVE I
MSCS 304 IMAGE PROCESSING

Instruction: 4 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 25 Marks	**External: 75 Marks**	**Total: 100 Marks**

UNITI

Fundamentals of Image Processing: Image Acquisition, Image Model, Sampling, Quantization, Relationship Between Pixels, Distance Measures, Connectivity, Image Geometry, Photographic Film.

Histogram: Definition, Decision Of Contrast Basing On Histogram, Operations Basing on Histograms Like Image Stretching, Image Sliding, Image Classification. Definition and Algorithm of Histogram Equalization.

UNIT II

Image Transforms: A Detail Discussion On Fourier Transform, DFT,FFT,

Image Enhancement:

a) ArithmeticandLogicalOperations,PixelorPointOperations,SizeOperations,
b) Smoothing Filters-Mean, Median, Mode Filters–Comparative Study
c) EdgeEnhancementFilters–DirectorialFilters,Sobel,Laplacian,Robert,KIRSCH Homogeneity
d) LowPassFilters,HighPassFilters,SharpeningFilters.–ComparativeStudy

UNIT III

Image Enhancement: Design of Low Pass, High Pass, EDGE Enhancement, Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters in Frequency Domain Advantages of Filters in Frequency Domain, Comparative Study of Filters in Frequency, Domain and Spatial Domain.

Image Compression: Run Length Encoding, Contour Coding, Huffman Code, Compression Due to Change in Domain, Compression Due to Quantization Compressionatthe Time of Image Transmission. Brief Discussion on:-Image Compression Standards.

UNIT IV

Image Segmentation: Characteristics of Segmentation, Detection of Discontinuities, Thresholding Pixel Based Segmentation Method. Region Based Segmentation Methods, Segmentation by Pixel Aggregation, Segmentation by SubRegion Aggregation, Histogram Based Segmentation, Spilt and Merge Technique, Motion in Segmentation.

Morphology: Dilation, Erosion, Opening, Closing, Hit-And-Miss Transform, Boundary Extraction, Region Filling, Connected Components, Thinning, Thickening, Skeletons, Pruning Extensions to Gray – Scale Images, Application of Morphology in IP

Text Book:

1. DigitalImageProcessing,RafaelC.GonzalezAndRichardE.Woods, AddisonWesley

Reference Books:

1. FundamentalsOfElectronicImageProcessingByArthyr–R–Weeks,Jr.(PHI)
2. ImageProcessing,Analysis,AndMachineVisionByMilanSonkaVaclanHalavaRogerBoyle,VikasPublishingHouse.
3. Digital Image Processing, S. Jayaraman, S. Esakkirajan& T. Veera Kumar, TMH
4. Fundamentals of Digital Image Processing, Chris Solomon, Tobi Breckon, Wiley-Blackwell

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ELECTIVE II
MSCS 305 CLOUD COMPUTING

Instruction: 4 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 25 Marks	**External: 75 Marks**	**Total: 100 Marks**

UNIT I

Cloud Computing Basics - Cloud Computing Overview, Applications, Intranets and the Cloud, First Movers in the Cloud.The Business Case for Going to the Cloud - Cloud Computing Services, Business Applications, Deleting Your Datacenter, Salesforce.com, Thomson Reuters.

Organization and Cloud Computing - When You Can Use Cloud Computing, Benefits, Limitations, Security Concerns, Regulatory Issues, Cloud Computing with the Titans - Google, EMC, NetApp, Microsoft, Amazon, Salesforce.com, IBMPartnerships.

UNIT II

Hardware and Infrastructure - Clients, Security, Network, Services. Accessing the Cloud - Platforms, Web Applications, Web APIs,Web Browsers. Cloud Storage - Overview, Cloud Storage Providers, Standards - Application, Client, Infrastructure, Service.

Software as a Service - Overview, Driving Forces, Company Offerings, Industries Software plus Services - Overview, Mobile Device Integration, Providers, Microsoft Online.

UNIT III

Developing Applications - Google, Microsoft, Intuit QuickBase, Cast Iron Cloud, Bungee Connect, Development, Troubleshooting, Application Management.

Local Clouds and Thin Clients - Virtualization in Your Organization, Server Solutions, Thin Clients, Case Study: McNeilus Steel.

UNIT IV

Migrating to the Cloud - Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings, Migration, Best Practices and the Future of Cloud Computing - Analyze Your Service, Best Practices, How Cloud Computing Might Evolve.

Text Books:

1. Cloud Computing-A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. McGrawHill.

Reference Books:

1. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
2. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press

DSV PV MKK PVR BKR DL

ELECTIVE II
MSCS 305: SOFT COMPUTING

Instruction: 4 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 25 Marks	**External: 75 Marks**	**Total: 100 Marks**

UNIT I

Soft Computing: Introduction to Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Different Tools and Techniques, Usefulness and Applications.

Fuzzy Sets and Fuzzy Logic: Introduction, Fuzzy Sets Versus Crisp Sets, Operations on Fuzzy Sets, Extension Principle, Fuzzy Relations and Relation Equations, Fuzzy Numbers, Linguistic Variables, Fuzzy Logic, Linguistic Hedges, Applications.

UNIT II

Interference in fuzzy logic: fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzifications and Defuzzificataions, Fuzzy Controller, Fuzzy Controllers, Fuzzy Pattern Recognition, Fuzzy Image Processing, Fuzzy Database.

Artificial Neural Network: Introduction, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques, perception and convergence rule, Auto-associative and hetro-associative memory , Hebb's Learning, Adaline, Perceptron.

UNIT III

Multilayer Feed Forward Network: Back Propagation Algorithms, Different Issues Regarding Convergence of Multilayer Perceptron, Competitive Learning, Self-Organizing, Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.

Evolutionary and Stochastic Techniques: Genetic Algorithm (GA), Genetic Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysis of Selection Operations, Hypothesis of Building Blocks, Schema Theorem and Convergence of Genetic Algorithm, Simulated Annealing and Stochastic Models, Boltzmann Machine, Applications.

UNIT IV

Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables and Applications.

Hybrid Systems: Neural-Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications

Text Books:

1. Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, S. Rajsekaran and G.A. VijayalakshmiPai, Prentice Hall of India.
2. Rough Sets, Z.Pawlak, Kluwer Academic Publisher, 1991.
3. Intelligent Hybrid Systems, D. Ruan, Kluwer Academic Publisher, 1997

Reference Books:

1. Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford University Press.
2. Neural Fuzzy Systems, Chin-Teng Lin & C. S. George Lee, Prentice Hall PTR.
3. Learning and Soft Computing, V. Kecman, MIT Press, 2001
4. Fuzzy Sets and Fuzzy Logic, Klir& Yuan, PHI, 1997

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ELECTIVE II
MSCS 305 MOBILE COMPUTING

Instruction: 4 Periods/week	**Time: 3 Hours**	**Credits: 4**
Internal: 25 Marks	**External: 75 Marks**	**Total: 100 Marks**

UNIT-I

Introduction to Mobile Communications and Computing: Introduction to cellular concept, Frequency Reuse, Handoff, GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services, Introduction to mobile computing, novel applications, limitations, and architecture.

UNIT II

Wireless LANs: Introduction, Advantages and Disadvantages of WLANs, WLAN Topologies, Introduction to Wireless Local Area Network standard IEEE 802.11, Comparison of IEEE 802.11a, b, g and n standards, Wireless PANs, Hiper LAN, Wireless Local Loop

Wireless Networking: Introduction, Various generations of wireless networks, Fixed network transmission hierarchy, Differences in wireless and fixed telephone networks, Traffic routing in wireless networks, WAN link connection technologies, X.25 protocol, Frame Relay, ATM, Virtual private networks, Wireless data services, Common channel signaling, Various networks for connecting to the internet.

UNIT III

Database Issues: Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, file system, disconnected operations.

Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

UNIT IV

Mobile IP and Wireless Application Protocol: Introduction to Mobile IP, Introduction to Wireless Application Protocol, Application layer.

Text Books:

1. GottapuSasibhushana Rao, "Mobile Cellular Communication", Pearson Education, First Edition, 2013.
2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002.

PV MRK PVR BKR DL

MSCS 306 OBJECT ORIENTED SOFTWARE ENGINEERINGLAB

Practical: 3 Periods /week	**Time: 3 Hours**	**Credits: 2**
Internal: 50 Marks	**External: 50 Marks**	**Total: 100 Marks**

The Unified Modeling Language (UML) is a standard language for specifying, visualizing, constructing and documenting the artifacts of software systems. The primary goal of UML is to provide users a ready-to-use, expressive visual modeling language so that they can develop and exchange meaningful models.

This lab deals with object oriented analysis and design of a software problem using UML concepts and notations. The tool used is Rational Rose Enterprise Edition. Any other open source tool is also recommended.

Document the Software Project Management and Software Engineering activities for any two of the following projects. Any other project of interest also can be chosen.

1. Student Result Management System
2. Library Management System
3. Payroll System
4. Bank Loan System
5. Railway Reservation System
6. Automatic Teller Machine
7. Hostel Management System
8. Hospital Management System
9. Online Shopping System
10. Blood Bank Management System
11. GPS
12. Journal Publication System
13. Chatroom Application
14. Social Media Application

Software Project Management and Software Engineering activities specified below can be customized according to the features of the project.

- Problem Statement
- Feasibility Study
- Software Requirements Specification Document
- Estimation of Project Metrics
- Entity Relationship Diagram
- Use Case Diagrams
- Class Diagram
- Sequence Diagrams
- Activity Diagrams
- State Chart Diagrams
- Test coverage

References:

1. The Unified Modeling Language User Guide. Grady Booch,James Rumbaugh and Ivar Jacobson. Addison-Wesley.
2. Object Oriented Software Engineering: Practical Software Development using UML and Java. Timothy C Lethbridge & Robert, Langaneire, Mc Graw Hill

MSCS 307: DATA SCIENCE USING R PROGRAMMING LAB

Instruction: 3 Periods/week	**Time: 3 Hours**	**Credits: 2**
Internal: 50 Marks	**External: 50 Marks**	**Total: 100 Marks**

Students should be aware of usage of few packages and libraries of R. They should also be familiar with few functions used in R for visualization.

1. Implement all basic R commands
2. Interact data through .csv files(Import from and export to .csv files).
3. Get and Clean data using swirl excercises.(Use 'swirl' package, library and install that topic from swirl).
4. Visualize all Statistical measures(Mean,Mode, Median, Range, Inter Quartile Range etc., using Histograms, Boxplots and Scatter Plots).
5. Create a data frame with the following structure.

EMP ID	EMP NAME	SALARY	START DATE
1	Satish	5000	01-11-2013
2	Vani	7500	05-06-2011
3	Ramesh	10000	21-09-1999
4	Praveen	9500	13-09-2005
5	Pallavi	4500	23-10-2000

   a. Extract two column names using column name.
   b. Extract the first two rows and then all columns.
   c. Extract 3rd and 5th row with 2nd and 4th column.
6. Write R Program using 'apply' group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into
   i. 0 to 1 range with min-max normalization.
   ii. a value around 0 with z-score normalization.
7. Create a data frame with 10 observations and 3 variables and add new rows and columns to it using 'rbind' and 'cbind' function.
8. Create a function to discretize a numeric variable into 3 quantiles and label them as low, medium, and high. Apply it on each attribute of iris dataset to create a new data frame. 'discrete_iris' with Categorical variables and the class label.
9. Create a simple scatter plot using toothgrowth dataset using 'dplyr' library. Use the same data to indicate distribution densities using boxwhiskers.
10. Write R program to implement linear and multiple regression on 'mtcars' dataset to estimate the value of 'mpg' variable, with best R^2 and plot the original values in 'green' and predicted values in 'red'.
11. Write R Programs to implement k-means clustering, k-medoids clustering and density based clustering on iris dataset.
12. Write a R Program to implement decision trees using 'readingSkills' dataset.
13. Implement decision trees using 'iris' dataset using package party and 'rpart'.