

Syllabus of  
UNDERGRADUATE DEGREE COURSE

**B.Tech. VI Semester**

Computer Science and Engineering



Rajasthan Technical University, Kota  
Effective from session: 2022 – 2023



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

### III Year-VI Semester: B.Tech. Computer Science and Engineering

#### 6CS3-01: Digital Image Processing

**Credit: 2**  
**2L+0T+0P**

**Max. Marks: 100(IA:30, ETE:70)**  
**End Term Exam: 3 Hours**

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	01
2	<b>Introduction to Image Processing:</b> Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation.	04
3	<b>Image Transformation &amp; Filtering:</b> Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms and its properties, frequency domain filters, colour models, Pseudo colouring, colour transforms, Basics of Wavelet Transforms.	06
4	<b>Image Restoration:</b> Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering.	07
5	<b>Image Compression:</b> Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.	05
6	<b>Image Segmentation &amp; Representation:</b> Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Boundary representation, Boundary Descriptors.	05
	<b>Total</b>	<b>28</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

### III Year-VI Semester: B.Tech. Computer Science and Engineering

#### 6CS4-02:Machine Learning

**Credit: 3**

**3L+0T+0P**

**Max. Marks: 100(IA:30, ETE:70)**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	01
2	<b>Supervised learning algorithm:</b> Introduction, types of learning, application, Supervised learning: Linear Regression Model, Naive Bayes classifier Decision Tree, K nearest neighbor, Logistic Regression, Support Vector Machine, Random forest algorithm.	09
3	<b>Unsupervised learning algorithm:</b> Grouping unlabelled items using k-means clustering, Hierarchical Clustering, Probabilistic clustering, Association rule mining, Apriori Algorithm, f-p growth algorithm, Gaussian mixture model.	08
4	<b>Introduction to Statistical Learning Theory,</b> Feature extraction - Principal component analysis, Singular value decomposition. Feature selection – feature ranking and subset selection, filter, wrapper and embedded methods, Evaluating Machine Learning algorithms and Model Selection.	08
5	<b>Semi supervised learning, Reinforcement learning:</b> Markov decision process (MDP), Bellman equations, policy evaluation using Monte Carlo, Policy iteration and Value iteration, Q-Learning, State-Action-Reward-State-Action (SARSA), Model-based Reinforcement Learning.	08
6	<b>Recommended system,</b> Collaborative filtering, Content-based filtering Artificial neural network, Perceptron, Multilayer network, Back propagation, Introduction to Deep learning.	08
	<b>Total</b>	<b>42</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

### III Year-VI Semester: B.Tech. Computer Science and Engineering

#### 6CS4-03: Information Security System

**Credit:2**  
**2L+0T+0P**

**Max. Marks: 100(IA:30, ETE:70)**  
**End Term Exam: 3 Hours**

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	01
2	<b>Introduction to security attacks:</b> services and mechanism, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers.	06
3	<b>Modern block ciphers:</b> Block Cipher structure, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, its transformation functions, key expansion, example and implementation.  Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode.	06
4	<b>Public Key Cryptosystems with Applications:</b> Requirements and Cryptanalysis, RSA cryptosystem, Rabin cryptosystem, Elgamal cryptosystem, Elliptic curve cryptosystem.	06
5	<b>Cryptographic Hash Functions, their applications:</b> Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA).  Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers. Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm.	05
6	<b>Key management and distribution:</b> symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure. Remote user authentication with symmetric and asymmetric encryption, Kerberos.  Web Security threats and approaches, SSL architecture and protocol, Transport layer security, HTTPS and SSH.	04
	<b>Total</b>	<b>28</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

### III Year-VI Semester: B.Tech. Computer Science and Engineering

#### 6CS4-04: Computer Architecture and Organization

**Credit: 3**  
**3L+0T+0P**

**Max. Marks: 100(IA:30, ETE:70)**  
**End Term Exam: 3 Hours**

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	01
2	<b>Computer Data Representation:</b> Basic computer data types, Complements, Fixed point representation, Register Transfer and Micro-operations: Floating point representation, Register Transfer language, Register Transfer, Bus and Memory Transfers (Tree-State Bus Buffers, Memory Transfer), Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logical shift unit. Basic Computer Organization and Design Instruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Complete computer description, Design of Basic computer, design of Accumulator Unit.	10
3	<b>Programming The Basic Computer:</b> Introduction, Machine Language, Assembly Language, assembler, Program loops, Programming Arithmetic and logic operations, subroutines, I-O Programming. Micro programmed Control: Control Memory, Address sequencing, Micro program Example, design of control Unit.	7
4	<b>Central Processing Unit:</b> Introduction, General Register Organization, Stack Organization, Instruction format, Addressing Modes, data transfer and manipulation, Program Control, Reduced Instruction Set Computer (RISC) Pipeline And Vector Processing, Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors.	8
5	<b>Computer Arithmetic:</b> Introduction, Addition and subtraction, Multiplication Algorithms (Booth Multiplication Algorithm), Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit. Input-Output Organization, Input-Output Interface, Asynchronous Data Transfer, Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPU IOP Communication, Serial communication.	8
6	<b>Memory Organization:</b> Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence, Shared Memory Multiprocessors.	8
	<b>Total</b>	<b>42</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

### III Year-VI Semester: B.Tech. Computer Science and Engineering

#### 6CS4-05: Artificial Intelligence

**Credit: 2**

**2L+0T+0P**

**Max. Marks: 100(IA:30, ETE:70)**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	01
2	<b>Introduction to AI and Intelligent agent:</b> Different Approach of AI, Problem Solving : Solving Problems by Searching, Uninformed search, BFS, DFS, Iterative deepening, Bi directional search, Hill climbing, Informed search techniques: heuristic, Greedy search, A* search, AO* search, constraint satisfaction problems.	03
3	<b>Game Playing:</b> Minimax, alpha-beta pruning, jug problem, chess problem, tiles problem.	06
4	<b>Knowledge and Reasoning:</b> Building a Knowledge Base: Propositional logic, first order logic, situation calculus. Theorem Proving in First Order Logic. Planning, partial order planning. Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks.	06
5	<b>Learning:</b> Overview of different forms of learning, Supervised base learning: Learning Decision Trees, SVM, Unsupervised based learning, Market Basket Analysis, Neural Networks.	07
6	<b>Introduction to Natural Language Processing:</b> Different issue involved in NLP, Expert System, Robotics.	05
	<b>Total</b>	<b>28</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

### III Year-VI Semester: B.Tech. Computer Science and Engineering

#### 6CS4-06: Cloud Computing

Credit: 3

Max. Marks: 100(IA:30, ETE:70)

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	01
2	<b>Introduction:</b> Objective, scope and outcome of the course. Introduction Cloud Computing: Nutshell of cloud computing, Enabling Technology, Historical development, Vision, feature Characteristics and components of Cloud Computing. Challenges, Risks and Approaches of Migration into Cloud. Ethical Issue in Cloud Computing, Evaluating the Cloud's Business Impact and economics, Future of the cloud. Networking Support for Cloud Computing. Ubiquitous Cloud and the Internet of Things.	06
3	<b>Cloud Computing Architecture:</b> Cloud Reference Model, Layer and Types of Clouds, Services models, Data centre Design and interconnection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Fractures of cloud programming, Parallel and distributed programming paradigms-Map Reduce, Hadoop, High level Language for Cloud. Programming of Google App engine.	10
4	<b>Virtualization Technology:</b> Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server, Desktop, Network, and Virtualization of data-centre.	10
5	<b>Securing the Cloud:</b> Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture . Legal issues in cloud Computing. Data Security in Cloud: Business Continuity and Disaster Recovery , Risk Mitigation , Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management.	08
6	<b>Cloud Platforms in Industry:</b> Amazon web services , Google AppEngine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM	07
	<b>Total</b>	<b>42</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

### III Year-VI Semester: B.Tech. Computer Science and Engineering

#### 6CS5-11: Distributed System

**Credit: 2**  
**2L+0T+0P**

**Max. Marks: 100(IA:30, ETE:70)**  
**End Term Exam: 3 Hours**

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	01
2	<b>Distributed Systems:</b> Features of distributed systems, nodes of a distributed system, Distributed computation paradigms, Model of distributed systems, Types of Operating systems: Centralized Operating System, Network Operating Systems, Distributed Operating Systems and Cooperative Autonomous Systems, design issues in distributed operating systems. Systems Concepts and Architectures: Goals, Transparency, Services, Architecture Models, Distributed Computing Environment (DCE). Theoretical issues in distributed systems: Notions of time and state, states and events in a distributed system, time, clocks and event precedence, recording the state of distributed systems.	06
3	<b>Concurrent Processes and Programming:</b> Processes and Threads, Graph Models for Process Representation, Client/Server Model, Time Services, Language Mechanisms for Synchronization, Object Model Resource Servers, Characteristics of Concurrent Programming Languages (Language not included). Inter-process Communication and Coordination: Message Passing, Request/Reply and Transaction Communication, Name and Directory services, RPC and RMI case studies.	05
4	<b>Distributed Process Scheduling:</b> A System Performance Model, Static Process Scheduling with Communication, Dynamic Load Sharing and Balancing, Distributed Process Implementation. Distributed File Systems: Transparencies and Characteristics of DFS, DFS Design and implementation, Transaction Service and Concurrency Control, Data and File Replication. Case studies: Sun network file systems, General Parallel file System and Window's file systems. Andrew and Coda File Systems.	06
5	<b>Distributed Shared Memory:</b> Non-Uniform Memory Access Architectures, Memory Consistency Models, Multiprocessor Cache Systems, Distributed Shared Memory, Implementation of DSM systems. Models of Distributed Computation: Preliminaries, Causality, Distributed Snapshots, Modelling a Distributed Computation, Failures in a Distributed System, Distributed Mutual Exclusion, Election, Distributed Deadlock handling, Distributed termination detection.	06
6	<b>Distributed Agreement:</b> Concept of Faults, failure and recovery, Byzantine Faults, Adversaries, Byzantine Agreement, Impossibility of Consensus and Randomized Distributed Agreement. Replicated Data Management: concepts and issues, Database Techniques, Atomic Multicast, and Update Propagation. CORBA case study: Introduction, Architecture, CORBA RMI, CORBA Services.	05
	<b>Total</b>	<b>28</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

### III Year-VI Semester: B.Tech. Computer Science and Engineering

#### 6CS5-12: Software Defined Network

Credit: 2  
2L+0T+0P

Max. Marks: 100(IA:30, ETE:70)  
End Term Exam: 3 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	01
2	<b>History and Evolution of Software Defined Networking (SDN):</b> Separation of Control Plane and Data Plane, IETF Forces, Active Networking. <b>Control and Data Plane Separation:</b> Concepts, Advantages and Disadvantages, the Open Flow protocol.	03
3	<b>Network Virtualization:</b> Concepts, Applications, Existing Network Virtualization Framework (VMWare and others), Mininet based examples. <b>Control Plane:</b> Overview, Existing SDN Controllers including Floodlight and Open Daylight projects.	05
4	<b>Customization of Control Plane:</b> Switching and Firewall Implementation using SDN Concepts. <b>Data Plane:</b> Software-based and Hardware-based; Programmable Network Hardware.	07
5	<b>Programming SDNs:</b> Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs. Network Functions Virtualization (NFV) and <b>Software Defined Networks:</b> Concepts, Implementation and Applications.	07
6	<b>Data Center Networks:</b> Packet, Optical and Wireless Architectures, Network Topologies. <b>Use Cases of SDNs:</b> Data Centers, Internet Exchange Points, Backbone Networks, Home Networks, Traffic Engineering. Programming Assignments for implementing some of the theoretical concepts listed above.	05
	<b>Total</b>	<b>28</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

### III Year-VI Semester: B.Tech. Computer Science and Engineering

#### 6CS5-13: Ecommerce & ERP

**Credit: 2**  
**2L+0T+0P**

**Max. Marks: 100(IA:30, ETE:70)**  
**End Term Exam: 3 Hours**

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	01
2	<b>Introduction to E-Commerce:</b> Defining Commerce; Main Activities of Electronic Commerce; Benefits of E-Commerce; Broad Goals of Electronic Commerce; Main Components of E-Commerce; Functions of Electronic Commerce – Communication, Process Management, Service Management, Transaction Capabilities; Process of E-Commerce; Types of E-Commerce; Role of Internet and Web in E-Commerce; Technologies Used; E-Commerce Systems; Pre-requisites of E-Commerce; Scope of E-Commerce; E-Business Models.	03
3	<b>E-Commerce Activities:</b> Various Activities of E-Commerce; Various Modes of Operation Associated with E-Commerce; Matrix of E-Commerce Types; Elements and Resources Impacting E-Commerce and Changes; Types of E-Commerce Providers and Vendors; Man Power Associated with E-Commerce Activities; Opportunity Development for E-Commerce Stages; Development of E-Commerce Business Case; Components and Factors for the Development of the Business Case; Steps to Design and Develop an E-Commerce Website.	05
4	<b>Internet – The Backbone for E-Commerce:</b> Early Ages of Internet; Networking Categories; Characteristics of Internet; Components of Internet – Internet Services, Elements of Internet, Uniform Resource Locators, Internet Protocol; Shopping Cart, Cookies and E-Commerce; Web Site Communication; Strategic Capabilities of Internet.	07
5	<b>ISP, WWW and Portals:</b> Internet Service Provider (ISP); World Wide Web (WWW); Portals – Steps to build homepage, Metadata; Advantages of Portal; Enterprise Information Portal (EIP). <b>E-Commerce &amp; Online Publishing:</b> This unit explains the concept of online publishing, strategies and approaches of online publishing, and online advertising.	07
6	<b>XML and Data Warehousing:</b> Definition of eXtensible Markup Language (XML); XML Development Goals; Comparison between HTML and XML; Business importance in using XML Based Technology; Advantages, Disadvantages and Applications of XML; Structure of an XML Document; XHTML and X/Secure; Data Warehousing; Data Marts and Operational Data Stores. <b>E-Marketing:</b> Traditional Marketing; E-Marketing; Identifying Web Presence Goals – Achieving web presence goals, Uniqueness of the web, Meeting the needs of website visitors, Site Adhesion: Content, format and access; Maintaining a Website; Metrics Defining Internet Units of Measurement; Online Marketing; Advantages of Online Marketing.	05
		28

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

### III Year-VI Semester: B.Tech. Computer Science and Engineering

#### 6CS4-21: Digital Image Processing Lab

**Credit: 1.5**

**Max. Marks: 100(IA:60, ETE:40)**

**OL+OT+3P**

**End Term Exam: 2 Hours**

SN	List of Experiments
1	Point-to-point transformation. This laboratory experiment provides for thresholding an image and the evaluation of its histogram. Histogram equalization. This experiment illustrates the relationship among the intensities (gray levels) of an image and its histogram.
2	Geometric transformations. This experiment shows image rotation, scaling, and translation. Two-dimensional Fourier transform.
3	Linear filtering using convolution. Highly selective filters.
4	Ideal filters in the frequency domain. Non Linear filtering using convolutional masks. Edge detection. This experiment enables students to understand the concept of edge detectors and their operation in noisy images.
5	Morphological operations: This experiment is intended so students can appreciate the effect of morphological operations using a small structuring element on simple binary images. The operations that can be performed are erosion, dilation, opening, closing, open-close, close-open.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

### III Year-VI Semester: B.Tech. Computer Science and Engineering

#### 6CS4-22: Machine Learning Lab

**Credit: 1.5**

**Max. Marks: 100(IA:60, ETE:40)**

**OL+OT+3P**

**End Term Exam: 2 Hours**

SN	List of Experiments
1	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7	Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

### III Year-VI Semester: B.Tech. Computer Science and Engineering

#### 6CS4-23: Python Lab

**Credit: 1.5**

**OL+OT+3P**

**Max. Marks: 100(IA:60, ETE:40)**

**End Term Exam: 2 Hours**

SN	List of Experiments
1	Write a program to demonstrate basic data type in python.
2	Write a program to compute distance between two points taking input from the user Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
3	Write a Program for checking whether the given number is an even number or not. Using a for loop, write a program that prints out the decimal equivalents of $1/2$ , $1/3$ , $1/4$ , . . . , $1/10$
4	Write a Program to demonstrate list and tuple in python. Write a program using a for loop that loops over a sequence. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
5	Find the sum of all the primes below two million. By considering the terms in the Fibonacci sequence whose values do not exceed four million, WAP to find the sum of the even-valued terms.
6	Write a program to count the numbers of characters in the string and store them in a dictionary data structure. Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure.
7	Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file? Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
8	Write a program to print each line of a file in reverse order. Write a program to compute the number of characters, words and lines in a file.
9	Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on. Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.
10	Write a program to implement Merge sort. Write a program to implement Selection sort, Insertion sort.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Syllabus

### III Year-VI Semester: B.Tech. Computer Science and Engineering

#### 6CS4-24: Mobile Application Development Lab

**Credit: 1.5**

**Max. Marks: 100(IA:60, ETE:40)**

**OL+OT+3P**

**End Term Exam: 2 Hours**

SN	List of Experiments
1	To study Android Studio and android studio installation. Create “Hello World” application.
2	To understand Activity, Intent, Create sample application with login module.(Check username and password).
3	Design simple GUI application with activity and intents e.g. calculator.
4	Develop an application that makes use of RSS Feed.
5	Write an application that draws basic graphical primitives on the screen
6	Create an android app for database creation using SQLite Database.
7	Develop a native application that uses GPS location information
8	Implement an application that writes data to the SD card.
9	Design a gaming application
10	Create an application to handle images and videos according to size.