INTRODUCTION TO ARTIFICIAL INTELLIGENCE		SEMESTER	V
Course Code	BBCA501	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	03:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	3	Exam Hours	3

COURSE OBJECTIVES:

After the successful completion of the course, the student will be able to

- Gain a historical perspective of AI and its foundations.
- Become familiar with basic principles and strategies of AI towards problem solving.
- Understand and apply approaches of inference, perception, knowledge representation, and learning.
- Understand the various applications of AI.

MODULE-1

Introduction- What is Artificial Intelligence, Foundations of AI, History, AI - Past, Present and Future. Intelligent Agents- Environments- Specifying the task environment, Properties of task environments, Agent based programs-Structure of Agents, Types of agents- Simple reflex agents, Model-based reflex agents, Goal-based agents; and Utility-based agents.

MODULE-2

Problem Solving by Searching-Problem-Solving Agents, Well-defined problems and solutions, examples Problems, Searching for Solutions, Uninformed Search Strategies Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bidirectional search.

MODULE-3

Knowledge Representation - Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic, First-Order Logic-Syntax and Semantics of First-Order Logic, Using First-Order Logic, Unification and Lifting Forward Chaining, Backward Chaining

MODULE-4

Learning– Forms of Learning, Supervised Learning, Machine Learning - Decision Trees, Regression and Classification with Linear Models, Artificial Neural Networks, Support Vector Machines

MODULE-5

Applications of AI - Natural Language Processing, Text Classification, and Information Retrieval, Speech Recognition, Image processing and computer vision, Robotics.

Teaching Methodology: Chalk and talk method / PowerPoint Presentation

COURSE OUTCOMES:

CO 1. Understand the foundations, history, and evolution of Artificial Intelligence, and analyze intelligent agents and their environments. [L2]

CO 2. Apply problem-solving techniques through uninformed and informed search strategies, including heuristic-based approaches. [L3]

CO 3. Demonstrate knowledge representation using propositional and first-order logic, and reasoning through inference mechanisms. [L3]

CO 4. Analyze machine learning models including decision trees, neural networks, and support vector machines in supervised learning contexts. [L3]

CO 5.	**Explore** real-world AI applications in natural language processing, speech recognition, computer vision, and robotics. [L3]

Suggested Learning Resources:

Books:

1. Stuart Russell, Peter Norvig: Artificial Intelligence: A Modern Approach, 4th Edition (2020).
2. Tom Mitchell, "Machine Learning", 1st Edition, McGraw-Hill,2017

Links:

1. NPTEL: https://youtu.be/GHpchgLoDvI?si=v0OnK7CF7TV6fsIb
2. https://www.youtube.com/live/aFunTuTTN28?si=nOMEzH6wAL1DdGeR

THEORY OF COMPUTATION		SEMESTER	V
Course Code	BBCA502	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	03:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	3	Exam Hours	3

COURSE OBJECTIVES:
After the successful completion of the course, the student will be able to
- To introduce the fundamentals of automata theory, including DFA, NFA, and their applications.
- To understand regular expressions, regular languages, and methods to prove regularity or non-regularity.
- To explore context-free grammars, parse trees, and pushdown automata with their equivalence and applications.
- To study deterministic PDAs, grammar normal forms, and limitations of context-free languages.
- To understand Turing machines, undecidability, and the basics of computability.

MODULE-1

Introduction to Finite Automata: The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata. An application of finite automata, Finite automata with Epsilon transitions.

MODULE-2

Regular Expressions: Finite Automata and Regular Expressions Applications of Regular Expressions. Regular languages; Proving languages not to be regular languages; Closure properties of regular languages; Decision properties of regular languages; Equivalence and minimization of automata.

MODULE-3

Context–free grammars: Parse trees; Applications; Ambiguity in grammars and Languages. Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's.

MODULE-4

Deterministic Pushdown Automata: Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFLs. Problems that Computers cannot solve.

MODULE-5

The Turing machine: Programming techniques for Turing Machines. Undecidability, A Language that is not recursively enumerable; An Undecidable problem that is RE; Post's Correspondence problem.

Teaching Methodology: Chalk and talk method / PowerPoint Presentation

COURSE OUTCOMES:

CO1. Understand basic concepts of automata and construct DFA, NFA, and ε-NFA. **[L2]**

CO2. Apply regular expressions to define regular languages and their properties. **[L3]**

CO3. Build and compare context-free grammars and PDAs and identify ambiguities. **[L3]**

CO4. Analyze deterministic PDAs, apply normal forms and pumping lemma, and understand CFL limitations. **[L3]**

CO5. Evaluate Turing machines and explain undecidability and related problems. **[L4]**

Suggested Learning Resources:
Books:

1. Theory of Computation"Author: K.L.P. Mishra and N. ChandrasekaranPublisher: Prentice Hall of India (PHI).
2. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson Education, 2011.

Links:

1. https://youtu.be/al4AK6ruRek?si=elamQZfk3MrY2SBV
2. https://youtu.be/dVDUcuWPixU?si=T4IXWrH_KpyFxLu8

MOBILE APPLICATION DEVELOPMENT		SEMESTER	V
Course Code	BBCA503	**CIE Marks**	50
Teaching Hours/Week (L: P: SDA)	03:0:0	**SEE Marks**	50
Total Hours of Pedagogy	40	**Total Marks**	100
Credits	3	**Exam Hours**	3

COURSE OBJECTIVES:

After the successful completion of the course, the student will be able to

- Create Servlets for server-side programming Create, test and debug Android application by setting up Android development environment
- Critique mobile applications on their design pros and cons.
- Program mobile applications for the Android operating system and understand techniques for designing and developing sophisticated mobile interfaces.
- Deploy applications to the Android marketplace for distribution.

MODULE-1

Android OS design and Features: Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications. Best practices in Android programming, Android tools, Building your First Android application.

MODULE-2

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

MODULE-3

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

MODULE-4

Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

MODULE-5

Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Deploying Android Application to the World.

Teaching Methodology: Chalk and talk method / PowerPoint Presentation

COURSE OUTCOMES:

CO 1. **Explain** Android OS design principles, set up the Android development environment, and build a basic Android application. [L2]

CO 2. **Design** Android application architecture using Activities, Services, Intents, and manage configurations through the Android Manifest. [L3]

CO 3. **Create** effective Android user interfaces using layouts, UI elements, and animations. [L3]

CO 4. **Apply** testing, debugging, and publishing techniques to Android applications and manage application resources systematically. [L3]

CO 5. **Apply** Android APIs for data storage, content sharing, networking, and deploy applications effectively to real-world platforms. [L3]

Suggested Learning Resources:

Books:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013
2. Lauren Darcey and Shane Conder , "Android Wireless Application Development", Pearson Education, 2nd ed. (2011).
3. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd

Links:

1. NPTEL: https://youtu.be/fis26HvvDII?si=nh66zZBX8OmKrDBA
2. https://www.tutorialspoint.com/android/android_studio.htm

CLOUD COMPUTING		SEMESTER	V
Course Code	BBCA504	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	03:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	3	Exam Hours	3

COURSE OBJECTIVES:
After the successful completion of the course, the student will be able to
- Explain the core concepts of the cloud computing paradigm such as how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
- Apply the fundamental concepts in data centres to understand the trade-offs in power, efficiency and cost.
- Identify resource management fundamentals like resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
- Analyze various cloud programming models and apply them to solve problems on the cloud.

MODULE-1

Introduction: Different Computing Paradigms- Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing etc., Comparison of various Computing Technologies; Cloud Computing Basics- What is Cloud Computing? History, Characteristic Features, Advantages and Disadvantages, and Applications of Cloud Computing; Trends in Cloud Computing; Leading Cloud Platform Service Providers.

MODULE-2

Cloud Architecture: Cloud Service Models- Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS), Comparison of different Service Models; Cloud Deployment Models- Public Cloud; Private Cloud, Hybrid Cloud, Community Cloud; Cloud Computing Architecture- Layered Architecture of Cloud. **Virtualization**- Definition, Features of Virtualization; Types of Virtualizations- Hardware Virtualization, Server Virtualization, Application Virtualization, Storage Virtualization, Operating System Virtualization; Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples- Xen: Paravirtualization, VMware: Full Virtualization, Microsoft Hyper-V.

MODULE-3

Cloud Application Programming and the Aneka Platform: Aneka Cloud Application Platform- Framework Overview, Anatomy of the Aneka Container; Building Aneka Clouds (Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode); Cloud Programming and Management- Aneka SDK (Application Model and Service Model); Management Tools (Infrastructure, Platform and Application management).

MODULE-4

Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services, Communication Services, Additional Services; Google App Engine- Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations; Microsoft Azure Azure Core Concepts (Compute, Storage, Core Infrastructure and Other Services), SQL Azure, Windows Azure Platform

MODULE-5

Cloud Applications: Scientific Applications- Healthcare (ECG Analysis in the Cloud), Biology (Protein Structure Prediction and Gene Expression Data Analysis for Cancer Diagnosis), Geoscience (Satellite Image Processing); Business and Consumer Applications- CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.
Teaching Methodology: Chalk and talk method / PowerPoint Presentation

COURSE OUTCOMES:

CO 1. **Understand** and differentiate various computing paradigms and explain the basics, characteristics, advantages, and trends of Cloud Computing.[L2]

CO 2. **Analyze** cloud service models, deployment models, cloud architecture, and comprehend the role and types of virtualizations in cloud environments. [L3]

CO 3. **Demonstrate** the ability to build and manage cloud applications using the Aneka platform and apply cloud programming concepts effectively.[L3]

CO 4. **Explore** and evaluate major cloud service providers such as AWS, Google App Engine, and Microsoft Azure, including their core services and architectures.[L3]

CO 5. **Identify** and assess the role of cloud computing in scientific, business, and consumer applications across various domains.[L3]

Suggested Learning Resources:

Books:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi: "Mastering Cloud Computing Foundations and Applications Programming", Elsevier, 2013.
2. K Chandrasekaran "Essentials of Cloud Computing" , CRC Press, 2015.

Links:

1. NPTEL: https://youtu.be/ZHCtVZ6cjdg
2. https://explore.skillbuilder.aws/learn/courses/134/aws-cloud-practitioner-essentials

DIGITAL MARKETING		SEMESTER	V
Course Code	BBCA5051	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	04:0:0	SEE Marks	50
Total Hours of Pedagogy	52	Total Marks	100
Credits	4	Exam Hours	3

COURSE OBJECTIVES:

After the successful completion of the course, the student will be able to
- To develop and strengthen entrepreneurial quality and motivation in students.
- To impart basic entrepreneurial skills and understandings to run a business efficiently and effectively.
- To provide insights to students on entrepreneurship opportunities, sources of funding and institutions supporting entrepreneurs.
- To make students understand the ways of starting a company of their own.

MODULE-1

Introduction to Digital Marketing: Concept of Digital Marketing, Origin, traditional versus Digital Marketing. DigitalMarketing Strategy- The P-O-E-M Framework, Segmenting and customizing Messages,Digital Landscape. Digital advertising Market in India. Skills required in DigitalMarketing, Digital Marketing Plan,

MODULE-2

Display Advertising: Concept of Display Advertising, types of display ads, buying models, display plan Targeting- contextual targeting placement targeting, remarketing, interest categories, geographic and language tagging, demographics, mobile, other targeting methods. Programmatic digital advertising, YouTube Advertising.

MODULE-3

Search Engine Advertising: Understanding Ad Placement, Understanding Ad Ranks, Creating First Ad Campaign, Performance Reports. Social Media Marketing: Building a successful Strategy.
Social Media Marketing: Introduction, Advantages, Face Book Marketing, Instagram & Snap chat, Linked in Marketing, Twitter Marketing.

MODULE-4

Mobile Marketing: Mobile Usage, Mobile Advertising- Mobile Advertising Models, advantages of Mobile advertising, Mobile Marketing Toolkit, Mobile Marketing features- Location based services, social marketing on mobile, QR Codes, Augmented Reality, Gamification.

MODULE-5

Search Engine Optimization: How search engines work, concept of search engine optimization (SEO), On Page Optimization, Off Page Optimization, Social media Reach, Maintenance-SEO tactics, Google Search Engine, Web Analytics- Key Metrics- concepts only.

Teaching Methodology: Chalk and talk method / PowerPoint Presentation

COURSE OUTCOMES:

CO 1. Explain core concepts and strategies of digital marketing. [L2]

CO 2. Apply targeting methods in display and YouTube advertising. [L3]

CO 3. Develop campaigns for search engine and social media marketing. [L3]

CO 4. Utilize mobile marketing tools and techniques. [L3]

CO 5. Implement SEO practices and interpret basic web analytics. [L3]

Suggested Learning Resources:

Books:

1. Digital Marketing, Seema Gupta, McGraw Hill Education, 2017
2. Fundamentals of Digital Marketing, Puneet Bhatia, Pearson, 2/e,2014
3. Social Media Marketing, Tracy L Tuten, Michael R Solomon, Sage Publications, 3/e,2020

Links:

https://youtu.be/cK6Rb7IcePY?si=nR03_dBCZ9mGCAFw

ADVANCED JAVA		SEMESTER	V
Course Code	BBCA5052	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	4:0:0	SEE Marks	50
Total Hours of Pedagogy	04	Total Marks	100
Credits	04	Exam Hours	03

COURSE OBJECTIVES:

CO1: Demonstrate the concepts of Event handling

CO2: Demonstrate the concepts of Applets

CO3: Demonstrate the fundamental concepts of Swings

CO4: Apply database interaction through JavaDatabaseConnectivity

CO5: Design and develop applications using java servlets

MODULE-1

Event Handling: Event, Event Source, Event Classes, Event Listener interface, Examples, Handling Windows Events, Adapter Classes, Inner classes.

MODULE-2

Applets: How Applets differ from Applications, Preparing to write applet, Building applet code, Applet life cycle, Creating an executable applet, Applet tags, adding applet to HTML file, Getting input from the user. Graphics: The graphics class, Lines and rectangles, Circles and ellipses, Drawing arcs, Drawing polygons, Line graphs, Drawing bar charts.

MODULE-3

Swing: IntroductiontoJFC(JavaFoundationClasses),Swing,SwingFeatures,JComponent,JApplet,JFrame,JPannel, JTextField, JButtons, JCheckBox and JRadioButton, JComboBox,JScrollPane, JList.

MODULE-4

JDBC Architecture: Introduction to JDBC, Java and JDBC, JDBC VS ODBC, JDBC DRIVER MODEL, JDBC Driver Types, Types of Driver Managers, JDBC Connection process, Statement object, preparedStatement object, operations on Resultset(Read,insert,updateanddelete),transaction processing,Metadata,ResultsetMetadata,Datatypes.

MODULE-5

Servlet: Life cycle of Servlet, Java Servlet Development Kit, Javax.servlet package, Reading Servlet Parameters, Reading Initialization Parameters, The javax.servlet.http Package, Handling HTTP.

Teaching Methodology: Chalk and talk method / PowerPoint Presentation

COURSE OUTCOMES:

CO1: Apply the concept of Event handling to solve the given problem

CO2: Apply the concepts of applets to build java applications

CO3: Apply the concepts of swings to build java applications

CO4: Use JDBC applications to build database applications

CO5: Develop java servlets applications

Suggested Learning Resources:

Books

1. Balaguruswamy,ProgrammingwithJAVAAprimer,4thEdition,TATAMcGraw-Hill
2. HerbertSchildt,TheJava2:CompleteReference,Fourthedition,TMH,
3. CaySHorstmann,FaryCornell,CoreJava2,Volume–I,SunMicrosystemsPress
4. JimKeogh,J2EE:ThecompleteReference,McGrawHill
5. HerbertSchildt,TheJava2:CompleteReference,Fourthedition,TMH
6. https://docs.oracle.com/javase/tutorial/

Object Oriented Modeling Design		Semester	V
Course Code	BBCA5053	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40 Hrs	Total Marks	100
Credits	04	Exam Hours	04

Course objectives:
- To introduce the fundamentals of object-oriented development and explain its key concepts, advantages, limitations, and the need for modeling languages like UML.
- To familiarize students with various UML notations.
- To develop the ability to design advanced structural and behavioral models.
- To enable students to model dynamic behaviors of systems.
- To provide the skills necessary to build architectural models of systems.

Module-1
Introduction: What Is Object-Oriented Development?, Key Concepts of Object-Oriented Design, Benefits and Drawbacks of the Paradigm.Introducing the UML. **Basic Structural Model**: Classes, Relationships, Duiagrams, class diagrams.

Module-2
Object Oriented Notations: The Unified Modeling Language, Package Diagrams, Component Diagrams, Deployment Diagrams, Use Case Diagrams, Activity Diagrams, Class Diagrams,Sequence Diagrams, Interaction Overview Diagrams, Composite Structure Diagrams, State Machine Diagrams, Timing Diagrams, Object Diagrams, Communication Diagrams

Module-3
Advanced Structural Modeling: Advanced Classes, Interfaces, Types, and Roles, Packages, Instances, Object Diagrams **Basic BehavioralModeling**: Interactions, Use Cases, Use Case Diagrams, Interaction Diagrams, Activity Diagrams

Module-4
Advanced BehavioralModeling: Events and Signals, State Machines, Processes and Threads, Time and Space, Statechart Diagrams,

Module-5
Architectural Modeling: Components, Deployment, Collaborations, Patterns and Frameworks, Component Diagrams, Deployment Diagrams, : Systems and Models

Teaching Methodology: Chalk and talk method / PowerPoint Presentation.

Course outcome (Course Skill Set)
At the end of the course, the student will be able to :
  CO 1. Explain the fundamental concepts, principles, and benefits of object-oriented development and the use of UML for software modeling.
  CO 2. Apply various UML notations to model structural and behavioral aspects of software systems.
  CO 3. Design and construct advanced structural and behavioral models by identifying classes, interfaces, interactions, and use cases in real-world problems.
  CO 4. Demonstrate the ability to create advanced behavioral models such as state machines and manage processes, threads, and event-driven behaviors using UML diagrams.
  CO 5. Develop architectural models of software systems, including components, collaborations, and deployment diagrams, and utilize patterns and frameworks effectively.

Suggested Learning Resources:
Books
1. Grady Booch, James Rumbaugh, Ivar Jacobson – The Unified Modeling Language User Guide, Addison-Wesley.
2. Object-Oriented Analysis, Design and Implementation: An Integrated Approach (Third Edition) Brahma Dathan and SarnathRamnath Springer 2025 universities Press
3. Object-Oriented Analysis and Design with Applications, 3e January 2009 Grady Booch, Ivar Jacobson, and James Rumbaugh, Series Editors

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=ii9XAloOkpk

NOSQL		SEMESTER	V
Course Code	BBCA5054	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	04:0:0	SEE Marks	50
Total Hours of Pedagogy	52	Total Marks	100
Credits	4	Exam Hours	3

COURSE OBJECTIVES:

After the successful completion of the course, the student will be able to
- To provide an overview of NoSQL databases, their historical evolution, and how they differ from traditional relational databases.
- To introduce aggregate data models and explain data distribution strategies like replication, sharding, and MapReduce.
- To develop hands-on skills in working with NoSQL databases such as MongoDB, with emphasis on querying, consistency, transactions, and scalability.
- To analyze the storage architecture of column-oriented NoSQL databases like HBase and Cassandra, focusing on data storage, consistency, and availability.
- To understand the structure and operational features of key-value databases like Riak, including their query support and scalability in distributed systems.

MODULE-1

Introduction to NOSQL: Overview and History of NoSQL Databases. Definition of the Four Types ofNoSQL Database,TheValueof Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application andIntegration Databases.

MODULE-2

Aggregate Data Models: Key-Value and DocumentDataModels, Column-Family Stores, Aggregate Oriented Databases.
Distribution Models: Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding,Master-SlaveReplication,Peerto-PeerReplication.

MODULE-3

Interfacing and Interacting with Nosql: No SQLKey/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling.

MODULE-4

Understanding the Storage Architecture: Column-oriented NoSQL databases using ApacheHBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE,Column-FamilyDataStoreFeatures, Consistency, Transactions, Availability, QueryFeatures, Scaling.

MODULE-5

Key-Value Databases: NoSQLKey/Value databases using Riak, Key-Value Databases, Key-ValueStore,Key-Value StoreFeatures, Consistency, Transactions, QueryFeatures, Structure of Data, Scaling.

Teaching Methodology: Chalk and talk method / PowerPoint Presentation

COURSE OUTCOMES:

CO 1. Describe the evolution, characteristics, and types of NoSQL databases and compare them with relational databases. [L2]

CO 2. Explain aggregate data models and data distribution techniques such as replication,

sharing, and MapReduce.[L2]

CO 3. **Interface** with NoSQL databases like MongoDB, utilize query and scaling features, and understand consistency and transaction mechanisms. [L3]

CO 4. **Analyze** the architecture and features of column-oriented databases like HBase and Cassandra, focusing on consistency, availability, and scalability.[L3]

CO 5. **Evaluate** the structure and operations of key-value databases like Riak, including their query features, consistency, and scalability. [L3]

Suggested Learning Resources:

Books:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addision Wesley, 2012

2. Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN13: 978-9332557338)

3. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022)

4. Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)

Links:

1. https://youtu.be/aUPVpIYiLCc?si=hj7_pmZd43abM8uU
2. https://youtu.be/-s29jUAkg70?si=DvHYRgD_yw-KPnkb
3. https://www.ibm.com/cloud/learn/nosql-databases

WIRELESS COMMUNICATION		SEMESTER	V
Course Code	BBCA5055	CIE Marks	50
Teaching Hours/Week (L: P: SDA)	04:0:0	SEE Marks	50
Total Hours of Pedagogy	52	Total Marks	100
Credits	4	Exam Hours	3

COURSE OBJECTIVES:

After the successful completion of the course, the student will be able to

- To introduce wireless communication, cellular systems, and multiple access techniques.
- To study telecommunication networks, GSM, GPRS, satellite systems, and wireless LANs.
- To explore mobile network protocols, routing, and Mobile TCP.
- To understand WAP architecture and mobile application services.
- To examine database issues in mobile environments, including caching and query processing.

MODULE-1

Wireless Communication Fundamentals Cellular Systems- Frequency Management and Channel Assignment- types of handoffs and their characteristics, dropped call rates & their evaluation, MAC, SDMA, FDMA, TDMA, CDMA, Cellular Wireless Networks.

MODULE-2

Telecommunication Networks & Wireless LAN Telecommunication Systems:GSM, GPRS, Satellite Networks, Wireless LAN -IEEE 802.11, Architecture, services, MAC, Physical layer, IEEE 802.11a, 802.11b standards, HIPERLAN, BlueTooth.

MODULE-3

Mobile Network Layer & Transport Layer: Mobile IP, Dynamic Host Configuration Protocol, Routing, DSDV, DSR, Alternative Metrics. Traditional TCP, Mobile TCP

MODULE-4

APPLICATION LAYER WAP Model: Mobile Location based service, WAP Gateway, WAP protocols, WAP user agent profile, caching model-wireless bearers for WAP, WML, WML Scripts

MODULE-5

DATABASE ISSUES Database Issues: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

Teaching Methodology: Chalk and talk method / PowerPoint Presentation

COURSE OUTCOMES:

CO 1. **Explain** cellular systems, frequency management, and access techniques (FDMA, TDMA, CDMA). [L2]

CO 2. **Describe** telecommunication networks like GSM, GPRS, and wireless LAN standards. [L2]

CO 3. **Analyze** mobile IP, routing protocols, and Mobile TCP. [L3]

CO 4. **Interpret** WAP architecture and mobile services like WML. [L3]

CO 5. **Evaluate** database management issues in mobile systems, including caching and transaction models. [L3]

Suggested Learning Resources:

Books:

1. Pattnaik, Prasant Kumar, Mall, Rajib, "Fundamentals Of Mobile Computing", Second Edition, PHI Learning Pvt. Ltd., 2015.
2. Dr. Ashish N.Jani, Dr. N.N. Jani , Neeta Kanabar ," Mobile Computing - Technologies and Applications", 2010

COMPUTER GRAPHICS WITH OPENGL		SEMESTER	V
Course Code	BBCA5056	**CIE Marks**	50
Teaching Hours/Week (L: P: SDA)	04:0:0	**SEE Marks**	50
Total Hours of Pedagogy	50	**Total Marks**	100
Credits	4	**Exam Hours**	3

COURSE OBJECTIVES:
After the successful completion of the course, the student will be able to
- Understand concepts of Computer Graphics along with its applications
- Exploring mathematics for 2D and 3D graphics along with OpenGL API's
- Use of Computer graphics in animation and GUIdesign.
- Demonstrate Geometric transformations, viewing on both 2D and 3D objects
- Infer the representation of curves, surfaces, Color and Illumination models

MODULE-1

Computer Graphics: Introduction to Computer Graphics and Application of Computer Graphics.
OpenGL: Introduction to OpenGL, coordinate reference frames, specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, point attributes, line attributes, curve attributes, OpenGL fill area functions, OpenGL Vertex arrays, Line drawing algorithm- Bresenham's.

MODULE-2

2D and 3D graphics with OpenGL:
2D Geometric Transformations: Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates, OpenGL raster transformations, Transformation between 2D coordinate systems, OpenGL geometric transformation functions.
3D Geometric Transformations: 3D Translation, rotation, scaling, OpenGL geometric transformations functions.

MODULE-3

Interactive Input Methods and Graphical User Interfaces: Graphical Input Data, Logical Classification of Input Devices, Input Functions for Graphical Data, OpenGL Interactive Input-Device Functions, OpenGL Menu Functions, Designing a Graphical User Interface.

MODULE-4

Computer Animation: Design of Animation Sequences, Traditional Animation Techniques, General Computer- Animation Functions, Computer-Animation Languages, Character Animation, Periodic Motions, OpenGL Animation Procedures.

MODULE-5

Clipping: clipping window, normalization and viewport transformations, clipping algorithms, 2D point clipping, 2D line clipping algorithms: cohen-sutherland line clipping.

Color Models: Properties of light, color models, RGB and CMY color models.
Illumination Models: Light sources, basic illumination models-Ambient light, diffuse reflection, specular and phong model.

Teaching Methodology: Chalk and talk method / PowerPoint Presentation

CO1.	Demonstrate simple algorithms using OpenGL Graphics primitives and attributes.
CO2.	Apply mathematical concepts for 2-D and 3-D geometric transformations.
CO3.	Make use of OpenGL functions for Interactive Input, GUI and animations.
CO4.	Explain clipping algorithms, color models and illumination models.

Suggested Learning Resources:

Books:

1. Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version,4th Edition, Pearson Education, 2011.
2. Edward Angel: Interactive Computer Graphics- A Top-Down approach with OpenGL, 5th edition, Pearson Education, 2009.

Links:

1. https://nptel.ac.in/courses/106/106/106106090/
2. http://www.opengl-redbook.com/
3. www.openGL.org

MOBILE APPLICATION DEVELOPMENT LAB		Semester	V
Course Code	BBCAL506	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:2	SEE Marks	50
Total Hours of Pedagogy	14 sessions	Total Marks	100
Credits	03	Exam Hours	03
Type of the Course	Practical		

Course objectives:

- To develop Applications in android environment.
- To develop user interface applications.
- Create a mobile application by using various components like activity, views, services, content providers and receivers.
- To develop URL related applications.
- To develop storing, sharing and retrieving the data in Android Applications.

1. Development of Hello World Application.
2. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
3. Create a screen that has input boxes for UserName, Password, Address, Gender (radiobuttons for male and female), Age(numeric),Date of Birth(DatePicket),State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button (use any layout).
4. Create a simple calculator app that performs basic arithmetic operations (addition, subtraction, multiplication, division).
5. Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity.
6. Design an android application Send SMS using Intent.
7. Create an android application using Fragments.
8. Design an android application Using Radio buttons.
9. Design an android application for menu.
10. Create a user registration application that stores the user details in a database table.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

CO1. To develop and deploy basic Android applications by implementing user interfaces with standard UI components (e.g., EditText, Button, RadioButton, Spinner).

CO2. To implement and handle user input, events, and dynamic data interaction through Android UI elements and activity lifecycle.

CO3. To understand and apply the use of **Intents** for inter-activity communication, data passing, and triggering system features like SMS.

CO4. To design and manage complex forms and layouts involving user input validation, handling multiple types of data, and storing/retrieving data (e.g., through SQLite or SharedPreferences).

CO5. To develop and utilize advanced Android features like **Fragments**, **Menus**, and **Fragment Transactions** to create responsive, modular applications with efficient navigation.