NAGARJUNA COLLEGE OF ENGINEERING & TECHNOLOGY, BENGALURU

B.E. in Information Science & Engineering

Scheme & Syllabus 2020-2021

Outcome-Based Education (OBE) and Choice-Based Credit System (CBCS) **Effective from the Academic year 2022-2023**

Sl. No.	Course Code	Course Title	Teaching Department	Teaching Hours/Week				Examination				Credits
				L	T	P	S	Duration in Hrs	CIE Marks	SEE Marks	Total Marks	
1	20IST61	Cloud Computing	ISE	3	0	0	0	3	50	50	100	3
2	20ISI62	Android Programming (IC)	ISE	3	0	2	0	3	50	50	100	4
3	20ISI63	Advanced Web Programming (IC)	ISE	3	0	2	0	3	50	50	100	4
4	20IST64	Big Data Analytics	ISE	3	0	0	0	3	50	50	100	3
5	20IST65X	Professional Elective – II	ISE	3	0	0	0	3	50	50	100	3
6	20IST66X	Professional Elective – III	ISE	3	0	0	0	3	50	50	100	3
7	20EVN67	Environmental Studies	CIVIL	1	0	0	0	3	50	50	100	1
8	20IST68	Research Methodology	ISE	2	0	0	0	3	50	50	100	2
9	20PEC69	Employability Skills & Aptitude Training -II	T&P	1	2	0	0	3	50	50	100	2
				22	2	4	0		450	450	900	25

Professional Elective – II

Course Code	Course Name
20IST651	Object Oriented Modelling & Design
20IST652	Artificial Intelligence
20IST653	Block Chain Technology

Professional Elective – III

Course Code	Course Name
20IST661	Digital Image Processing
20IST662	Computer Vision
20IST663	Devops

CLOUD COMPUTING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST61	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PCC

Course Objectives:

This course will enable students to
- Identify the Cloud infrastructure components and service management processes
- Explain the fundamentals of cloud computing
- Gain the knowledge about virtualization and its techniques.
- Illustrate the cloud application programming and Aneka platform
- Differentiate Various cloud platforms used in industry

Prerequisite: Computer Networks, Database Management System, Operating system

Syllabus

Module – I

Introduction: Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0,Service-Oriented Computing, Utility- Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Google App Engine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjra soft Aneka. Virtualization: Introduction, Characteristics of Virtualized, Virtualization and Cloud Computing, Pros and Cons of Virtualization.

08 Hours

Module – II

Cloud Computing Architecture: Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition, Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy Organizational Aspects.Aneka: Cloud Application Platform, Framework Overview, Anatomy of the Aneka Container, From the Ground Up: Platform Abstraction Layer, Fabric Services, foundation Services, Application Services, 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, Management Tools.

08 Hours

Module – III

Concurrent Computing: Thread Programming, Introducing Parallelism for Single Machine Computation, Programming Applications with Threads, What is a Thread?, Thread APIs, Multithreading with Aneka, Introducing the Thread Programming Model, Aneka Thread vs. Common Threads. High-Throughput Computing: Task Programming, Task Computing, characterizing a Task, Computing Categories, Frameworks for Task Computing, Task-based Application Models, Embarrassingly Parallel Applications, Parameter Sweep Applications, Workflow Applications with Task Dependencies.

08 Hours

Module – IV

Data Intensive Computing: Map-Reduce Programming, What is Data-Intensive Computing? Characterizing Data-Intensive Computations, Challenges Ahead, Historical Perspective, Technologies for Data-Intensive Computing, Storage Systems, Programming Platforms.

08 Hours

Module – V

Cloud Platforms in Industry: Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google AppEngine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQLAzure, Windows Azure Platform Appliance.Cloud Applications: Scientific Applications, Business and Consumer Applications, CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.

08 Hours

Course Outcomes
On completion of this course, the students will be able to:
CO1: Explain cloud computing, classify services of cloud computing
CO2: Illustrate architecture and programming in cloud
CO3: Demonstrate data intensive computing.
CO4: Apply cloud computing services to commercial systems for deploying cloud
CO5: Analyzing different Cloud platform in industry and their applications

Text Books:
1) Rajkumar Buyya, Christian Vecchiola, and ThamaraiSelvi, "Mastering Cloud Computing", McGraw Hill Education, ISBN*:* 9780124095397

Reference Books:
1) Dan C. Marinescu, "Cloud Computing Theory and Practice", Morgan Kaufmann, Elsevier 2013.
2) Thomas Erl: "Cloud Computing", Pearson Education, 1st Edition, 2014, ISBN-13: 978-9332535923.

Reference Online Resources:
1) http://index-of.co.uk/Cloud-Computing-Books/Mastering%20Cloud%20Computing%20-%20Rajkumar%20Buyya.pdf
2) http://nptel.ac.in/courses/106105033/41
3) http://video.mit.edu/watch/mitef-nyc-cloud-computing-8347/

ANDROID PROGRAMMING (IC)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20ISI62	3:0:2:0	4	CIE:50 SEE:50	3 Hours	PCC

Course Objectives: This course will enable students to:
➢ Outline the Android SDK features and the Development Framework and understanding Activities.
➢ Learn adaptive, responsive user interfaces that work across a wide range of devices.
➢ Identify background work and long-running tasks in Android applications
➢ Describe the concepts of Storing, sharing and retrieving data in Android applications
➢ Learn permissions, security and performance affect applications.

Prerequisite: Basic Knowledge of JAVA Programming and XML (Extension Markup Language)

Syllabus

Module- I

Basics of Android
What Is Android? Android Versions, Features of Android, Architecture of Android, Android Devices in the Market, The Android Market, Obtaining the Required Tools, Eclipse, Android SDK, Android Development Tools (ADT), Creating Android Virtual Devices (AVDs), Creating Your First Android Application, Anatomy of an Android Application. Understanding Activities, Applying Styles and Themes to Activity, Hiding the Activity Title, Displaying a Dialog Window, Displaying a Progress Dialog, Linking Activities Using Intents, Resolving Intent Filter Collision, Returning Results from an Intent **.**

08 Hours

Module- II
Components of Screen, Views and Layouts
Understanding the Components of a Screen, Views and View Groups, Linear Layout, Absolute Layout, Table Layout, Relative Layout, Frame Layout, Scroll View, Adapting to Display Orientation, Anchoring Views, Resizing and Repositioning, Managing Changes to Screen Orientation, Persisting State Information during Changes in Configuration, Detecting Orientation Changes, Controlling the Orientation of the Activity, Creating the User Interface Programmatically, Basic Views.

08 Hours

Module- III
Image Views, Preferences ( ) and Storage
Using Image Views to Display Pictures - Gallery and Image View Views, Image Switcher, Grid View, Using Menus with Views - Creating the Helper Methods, Options Menu, Context Menu, Saving and Loading User Preferences - Using get Shared Preferences( ), Using get Preferences( ), Persisting Data to Files - Saving to Internal Storage, Saving to External Storage (SD Card), Choosing the Best Storage Option, Using Static Resources, Creating and Using Databases.

08 Hours

Module- IV

Content Provider, SMS Messaging

Sharing Data in Android, Using a Content Provider - Predefined Query String Constants, Projections, Filtering, Sorting, Creating Your Own Content Providers - Using the Content Provider. SMS Messaging - Sending SMS Messages Programmatically, Getting Feedback after Sending the Message, Sending SMS Messages Using Intent, Receiving SMS Messages, Updating an Activity from a Broadcast Receiver, Invoking an Activity from a Broadcast Receiver.

08 Hours

Module- V

Services, Activities and Publishing APK Files.

Creating Your Own Services - Performing Long-Running Tasks in a Service, Performing Repeated Tasks in a Service, Executing Asynchronous Tasks on, Separate Threads Using Intent Service, Communicating between a Service and an Activity, Binding Activities to Services. Preparing for Publishing, Versioning, Digitally Signing Your Android Applications, Deploying APK Files - Using the adb.exe Tool, using a Web Server, Publishing on the Android Market, Creating a Developer Profile, Submitting Your Apps.

08 Hours

List of Experiments

Programs supplement the lecture concepts will be based on the latest version of Android SDK.

PART-A
1) Develop an android app which displays "Hello World" message
2) Using Android, Create a login Activity. It asks "username" and "password" from user. If username and password are valid, it displays Welcome message using new activity
3) Create Implicit Intents
4) "Happy Birth Day" App using TextView and ImageView
5) Set and retrieve shared preferences

PART-B
1) Develop an android app which displays a form to get following information from user. 1) Username 2) Password 3) Email Address 4) Phone Number 5) Country Form should be followed by a Button with label "Submit". When user clicks the button, a message should be displayed to user describing the information entered. Utilize suitable UI controls (i.e. widgets). [When user enters country in Auto Complete TextView, list of states should be displayed in Spinner automatically]
2) The Simple Calculator app has two edit texts and four buttons. When you enter two numbers and click a button, the app performs the calculation for that button and displays the result.
3) Develop an android app for Text to Speech.
4) Create the MP3 player like application with service

Course Outcomes:
On completion of this course, students will be able to:
CO1: Comprehend the basic features of Android Platform and Create Activities in Android.
CO2: Demonstrate the design concepts of user interface using components and views in Android.
CO3: Create and use databases for Android Application.
CO4: Implement messaging services in Android.
CO5: Deploy mobile applications in various market place for distribution

Text Books:
1)   Wei – Meng Lee: "Beginning Android Application Development", Wiley publications, ISBN: 978-1-118-01711-1, (Chapters 1-8,10,11).
2)   Reto Meier: "Professional Android 4 Application Development", Wiley publications Publisher, 2012, ISBN-10: 812653608X

Reference Books:
1)   Mark Murphy: "Beginning Android 3", Apress Springer India Pvt. Ltd., 1st Edition, 2011, ISBN-13: 978-1-4302-3297-1
2)   Sayed Hashimi, Satya Komatineni, Dave MacLean; Pro Android 4; Apress Springer India Pvt Ltd; 1st Edition; 2012; ISBN: 978-1-4302-3930-7.

3)   Reto Meier: "Professional Android 2 Application Development", Wiley India Pvt. Ltd., 1st Edition, 2012, ISBN: 9788126525898.
4)   James Steele: "The Android Developer's Cookbook: Building Applications with the Android SDK", Addison-Wesley Professional, 2010.

E-Resources:
1)   https://developers.google.com/training/adf
2)   https://goo.gl/ADKvq8
3)   https://innovator.samsungmobile.com

Advanced Web Programming (IC)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20ISI63	3:0:2:0	4	CIE:50 SEE:50	3 Hours	PCC

Course Objectives:

This course will enable the students to:
- Apply the knowledge to manage and to handle web site design and development to solve the real-world problems.
- Illustrate user content using Bootstrap Front end Framework.
- Understand NodeJS and its facilities.
- LearnES6andbuildyourInteractive React User Interface.
- Develop Java based web applications using ReactJS and Spring Boot.

Syllabus

Module – 1   8 Hours

Bootstrap5: Front-end Design Framework

Bootstrap Scaffolding, Bootstrap CSS, Bootstrap Layout Components, Bootstrap Java Script Plugins, Using Bootstrap, Understanding Bootstrap Admin Templates.

Module – 2   8 Hours

NodeJS: Back-end Java Script runtime environment

Introduction to NodeJS, Setting up NodeJS, First Application, Node Package Manager (npm), Template Engines: Jade and Handler bars, Web Modules, Setting up Express Framework, Web app development in Express Framework.

Module – 3   8 Hours

ECMAScript6(ES6): Foundation for Modern Javascript Frameworks

ES6: What is ES6?, let &const keywords, Arrow functions, Default Parameters, Template literals, Destructuring Assignments, Enhanced Object Literals, Block scope, Spread andRest operators, Classes, Inheritance, Static properties and methods, Promises, Iterators and Iterables, Generators, Modules, ReactJS: What is React? Why React? Just React – HelloWorld,Usingcreate-react-app,Anatomyofreactproject,Runningtheapp,Debuggingfirst reactapp.

Module – 4   8 Hours

React: Building UI

Templating using JSX (Javascript Syntax Extension): Working with React, understanding the structure. Components: Significance of component architecture, Types of components, Functional, Class based, Pure, Component Composition. Working with states and props, Event Handling in React, Understanding component lifecycle and handling errors, Working with Forms, Context API, Code Splitting, Hooks, Routing using React Router, Introduction to Redux, Redux Middleware.

Module – 5	**8 Hours**

SpringBoot: Building Java based Web Application

Introduction to Micro Services, What is Spring Boot?, Why Spring Boot? How does it work? Spring boot bootstrapping, Spring boot tomcat development, build system, Building RESTFul Web services, Building Web application using React UI and spring Boot.

Course Outcomes:

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

1 Demonstrate an ability to identify formulate and solve the web based problems   **.**
2 Ability to apply conceptual skills of web site design and development.
3 Adapt Bootstrap frame work for front end views.
4 Develop Web App in NodeJS platform using Express framework.
5 Develop Java based Web Apps using ReactJS and Spring Boot.

Laboratory Programs

1. Explain the role of the following semantic elements of HTML5 with syntax and script segments:
    i <nav> ii<section>iii <aside>.
2. Build a web server using HTTP Module in Node JS and perform file system modules like
i. Read files
ii. Create files
iii. Update files
iv. Delete files
v. Rename files

3. Perform CRUD Operation in Mongo DB with connection to NodeJS.
4. Write a Program to handle async wait in Java script.
5. Design a page by creating Class and Functional based Components in React JS.
6. Create a basic app with Spring Boot and React to handle RESTful APIs for performing CRUD operations.

Text Book

1 Aravind Shenoy, Ulrich Sossou, "Learning Bootstrap" Packet Publishing.
2 Ethan Brown, "Web Development with Node & Express", O'Reilly Publications,ISBN:978-1-491-94930-6

3 Alex Banks & Eve Porcello, "Learning React–Modern Patterns for Developing React Apps ",O' Reilly Publications, ISBN:978-1-492-05172-5
4 Juha Hinkula, "Hands-On Full Stack Development with Spring Boot 2 and React: Build modern and scalable full stack applications using Spring Frame work5 and React with Hooks", 2nd Edition.

Reference Books

1 Dr.Axel   Rauschmayer,"ES6-JavascriptforImpatientProgrammers",ISBN978-1-09-121009-7
2 Fabio Cimo," Bootstrap Programming Cook book"
3 Craig Walls, "Spring in Action" Manning Shelter Island Publications, 5th Edition, ISBN:9781617294945.

BIG DATA ANALYTICS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST64	3:0:0:0	3	CIE: 50 SEE: 50	3 hours	PCC

Course Objectives:
This course will enable students to
➢ Understand Big – Data, Hadoop Distributed File system and MapReduce.
➢ Explore Hadoop tools and manage Hadoop Administration.
➢ Appraise the role of Business intelligence and its applications across industries.
➢ Assess core data mining techniques for data analytics.
➢ Learn various Text Mining techniques.

Prerequisite:

Good knowledge skill on Database and Data Structures

Syllabus

Module – I
Introduction To Big Data: Big Data and its importance, Four Vs, Big data applications. Introduction To Hadoop: Hadoop Distributed File System Basics, Hadoop components, Hadoop Eco-System, Hadoop MapReduce Framework.

08 Hours

Module – II
Essential Hadoop Tools – Yarn, Hive, Oozie, Pig, Flume, Hadoop YARN Applications, Managing Hadoop with Apache Ambari, Basic Hadoop Administration Procedures.

08 Hours

Module – III
Business Intelligence Concepts and Application – BI – Tools, Skills, Applications, Data Warehousing – Approaches and Architecture, Data Mining – CRISP – DM, Techniques, Tools, Myths, Mistakes, Data Visualization – Types of charts.

08 Hours

Module – IV
Decision Trees- Pseudo code, Regression – Logistic, Advantages and Disadvantages, Artificial Neural Networks – Design principles, Steps in developing ANN, Advantages and Disadvantages, Cluster Analysis - K-means algorithm, Association Rule Mining - Apriori algorithm.

08 Hours

Module – V
Text Mining – Architecture, TDM, Applications, Naïve-Bayes Analysis - Model, Advantages and Disadvantages, Support Vector Machines - Model, Advantages and Disadvantages, Web Mining – Content, Structure, Usage, Social Network Analysis - Techniques and Algorithm, Page Rank, Practical Considerations.

08 Hours

Course Outcomes

On completion of this course, the students are able to:

CO1: Master the concepts of Big Data, HDFS and Map Reduce framework

CO2: Investigate Hadoop related tools for Big Data Analytics and perform basic Hadoop Administration

CO3: Recognize the role of Business Intelligence, Data warehousing and Visualization in decision making

CO4: Demonstrate the importance of core data mining techniques for data analytics

CO5: Illustrate and analyse Text Mining Techniques

Text Books:

1) Douglas Eadline,"Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1stEdition, Pearson Education, 2016. ISBN-13: 978-9332570351

2) Anil Maheshwari, "Data Analytics", 1st Edition, McGraw Hill Education, 2017. ISBN-13: 978-9352604180

Reference Books:

1) Tom White, —Hadoop: The Definitive Guide‖,4 Edition, O'Reilly Media,

2) Boris Lublin sky, Kevin T. Smith, Alexey Yakubovich, —Professional Hadoop Solutions",1st Edition, Wrox Press, 2014ISBN-13: 978-8126551071

3) Eric Sammer, —Hadoop Operations: A Guide for Developers and Administrators",1st Edition, O'Reilly Media, 2012.ISBN-13: 978-9350239261

E-Resources:

1) https://www.tutorialspoint.com/big_data_tutorials.htm

2) https://nptel.ac.in/courses/106/104/106104189/

OBJECT ORIENTED MODELLING & DESIGN

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST651	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PEC

Course Description: Regardless of the software development approach, from the classic waterfall to extreme programming (XP), all of the experts agree that quality software development requires both analysis and design. The Unified Modelling Language (UML) provides a common, standard notation for recording both analysis models and design artifacts. This course delves into the processes of both object-oriented analysis and object-oriented design using UML as the notation language.

Prerequisite: Software Engineering (Software Design) Basic concepts: encapsulation, abstraction, inheritance, and polymorphism.

Course Objectives:

- To learn the importance of modelling in the software development life cycle.
- To apply the UML notation and symbols.
- To know the design patterns.
- To learn the object-oriented approach systems design and software solutions.
- To know the object oriented software testing.

Module -I

Basic concepts

Basic concepts: objects, classes, abstract classes, data types, ADT, encapsulation and information hiding, inheritance, association, aggregation, composition, polymorphism, dynamic binding, object-oriented principles.

08 Hours

Module -II

Modelling Using UML

UML Diagrams: Use case diagrams, class diagrams, various relationships among classes: generalization, association, aggregation, composition, inheritance, dependency etc., object diagram, UML packages, activity diagram, state machine diagram, sequence diagram, communication diagram, interaction overview diagram, component diagram, deployment diagram, UML 2 diagrams.

08 Hours

Module - III

Design Patterns

Basic pattern concepts, Types of patterns, some common design patterns such as Expert, Creator, Façade, MVS, MVC, Publish-Subscribe, Observer, Proxy etc.

08 Hours

Module - IV

Designing using UML

Overview of OOAD methodology, Use case model development, Domain modelling, Identification of entity objects, Brooch's object identification method, Interaction modelling, CRC cards, Applications of the analysis and design process, object-oriented design principles. OOD goodness criteria, CK Metrics, LK Metrics, MOOD Metrics, Code Refactoring

08 Hours

Module - V

Testing Object Oriented Software

Challenges in testing object-oriented software, Implications of object-oriented Features in testing object-oriented software, Importance of grey-box testing of object-oriented software, Coverage analysis, State-based testing, Class testing, Fault-Based Testing, Scenario-Based Test Design, Integration Testing: Thread-based integration Strategies, Use-based integration Strategies, Cluster Testing, Validation Testing, System Testing, Testing tools.

08 Hours

Course Outcomes:
At the end of this course, the students will learn:

- Understand the importance of modelling in the software development life cycle.
- Analyze to apply the UML notation and symbols.
- Understand the design patterns.
- Design and develop the object-oriented approach systems Design and software solutions.
- Explore object oriented software testing.

Text Book:

1. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI, 2018

Reference Books:
1. Rumbaugh and Blaha, Object-oriented Modeling and design with UML, Pearson, 2007
2. Bernd Bruegge and, Allen H. Dutoit, Object-Oriented Software Engineering Using UML, Patterns, and Java, Pearson, 2009

ARTIFICIAL INTELLIGENCE

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST652	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PEC

Course Objectives:
This course will enable students to:

➢ Understand AI technique to a given concrete problem

➢ Study non-trivial AI techniques to handle complex problem

➢ Understand uncertainty and Problem-solving techniques.

➢ Learn various symbolic knowledge representations to specify domains and reasoning tasks of a situated software agent.

➢ Gain knowledge on logical systems for inference over formal domain

Module-I

Introduction: What is AI? Intelligent Agents: Agents and environment; Rationality; the nature of environment; the structure of agents. Problem solving: Problem-solving agents; Example problems; Searching for solution; uninformed search strategies.

08Hours

Module-II

Informed Search, Exploration, Constraint Satisfaction, Adversial Search: Informed search strategies; Heuristic functions; On-line search agents and unknown environment .Constraint satisfaction problems; Back tracking search for CSPs. Adversial search: Games; Optimal decisions in games; Alpha- Beta pruning.

08 Hours

Module-III

Logical Agents: Knowledge-based agents; The wumpus world as an example world; Logic; propositional logic Reasoning patterns in propositional logic; Effective propositional inference; Agents based on propositional logic.

08 Hours

Module-IV

First-Order Logic, Inference in First-Order Logic-1: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic; Knowledge engineering in first-order logic. Propositional versus first-order inference; Unification and lifting

08Hours

Module-V

Inference in First-Order Logic-2: Forward chaining; backward chaining; Resolution.

08 Hours

Course Outcomes:

On completion of this course, students will be able to:

CO1: Design intelligent agents for solving simple gamingproblems.

CO2: Apply non-trivial AI techniques to handle complexproblems.

CO3: Apply various symbolic knowledge representation to specificproblems.

CO4: Design Knowledge-basedagents.

CO5: Describe syntax and semantics of first-orderlogic.

Text Books :

1) Stuart Russel, Peter Norvig: "Artificial Intelligence A Modern Approach", 2nd Edition, Pearson Education, 2003, (Chapters 1.1, 2, 3.1 - 3.4, 4.1, 4.2, 4.5, 5.1, 5.2, 6.1- 6.3, 7, 8, 9, 10, 11.1, 11.2, 11.4, 11.5, 13.1, 13.4, 13.5, 13.6,) ISBN:0-13-103805-2.

Reference Books:

1) Elaine Rich, Kevin Knight: "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009, ISBN-10: 0070087709.

2) Nils J. Nilsson: "Principles of ArtificialIntelligence", Elsevier, 1980, ISBN: 978-3-540-11340-9.

E-Resources:

1) http://stpk.cs.rtu.lv/sites/all/files/stpk/materiali/MI/Artificial%20Intelligence

2) http://www.getfreeebooks.com/16-sites-with-free-artificial-intelligence-ebook

Block Chain Technology

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST653	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PEC

Prerequisite: Network Security and Information Security

Course Objectives:
1. Understand about Symmetric and Asymmetric Encryption, block chain and Bit coin concepts
2. Analyze the Working of Block Chain System.
3. Design, build, and deploy smart contracts and distributed applications
4. Evaluate security, privacy, and efficiency of a given block chain system.
5. Cognize about 'digital' currency, Storage and Currency Exchange Services.

Syllabus

Module – I

Introduction to Block chain: Back story of Block chain, what is Block chain? Centralized vs. Decentralized Systems, Layers of Block chain, why is Block chain Important? Limitations of Centralized Systems, Block chain Adoption So Far, Block chain Uses and Use Cases How Block chain Works-1: Laying the Block chain Foundation, Cryptography, Symmetric Key Cryptography, Cryptographic Hash Functions.

08 Hours

Module – II

Cryptography and Transactions: Asymmetric Key Cryptography, Diffie-Hellman Key Exchange, Symmetric vs. Asymmetric Key Cryptography, Merkle Trees, Putting It All Together, Properties of Block chain Solutions, Block chain Transactions, Distributed Consensus Mechanisms, Block chain Applications, Scaling Block chain, Off-Chain Computation, Sharding Block chain State.

08 Hours

Module-III

Bitcoin Works: The History of Money, Dawn of Bitcoin, What Is Bitcoin? Working with Bitcoins, The Bitcoin Blockchain, Block Structure, The Genesis Block, The Bitcoin Network, Network Discovery for a New Node, Bitcoin Transactions, Consensus and Block Mining, Block Propagation, Bitcoin Scripts, Bitcoin Transactions Revisited, Scripts.

08 Hours

Module – IV

Ethereum and Crypto Currencies: Ethereum Introduction, Ethereum Blockchain, Elements of Ethereum Blockchain and Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges,Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Crypto currency.

08 Hours

Module – V

How to Store and Use Bitcoins: Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.

08 Hours

Course Outcomes

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

1. Gain Knowledge in Symmetric Encryption, Asymmetric Encryption, Block Chain System and Crypto currencies.
2. Analyze the working of Block Chain System, Ledger Transaction and Mining mechanism.
3. Design and Implement Ethereum block chain contract.
4. Pertain to ethical and legal usage of Block chain applications.
5. Use of Bitcoins, online wallets, Currency Exchanges and payment services.

Text Books:

1.Beginning Block chain: A Beginner's Guide to Building Block chain Solutions by Bikramaditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda

2.Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bit coin and Crypto-currency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Reference Books:

1. Mastering Bit coin by Andreas M. Antonopoulos
2. Block chain Technology: Crypto-currency and Applications by S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, Oxford University Press 2019.
3. Imran Bashir, Mastering Blockchain: Deeper Insights into Decentralization, Cryptography, Bitcoin, and Popular Blockchain Frameworks, Packt Publishing, 1st Edition, 2017.

E-Resources:

1. NPTEL online course : https://nptel.ac.in/courses/106/104/106104220/#
2. Udemy: https://www.udemy.com/course/build-your-blockchain-az/
3. EDUXLABS Online training :https://eduxlabs.com/courses/blockchain technology- training/?tab=tab-curriculum

Digital Image Processing

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST661	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PEC

Course Objectives:
This course will enable students to :
- Study the fundamental concepts of image representation and image processing system.
- Evaluate techniques followed in image enhancements
- Illustrate image segmentation and compression algorithms

Syllabus

Module – I

Introduction to Image Processing: Digital Image Fundamentals Light, brightness adaption and discrimination, Human visual system, Image as a 2D data, Image representation Gray scale and Color images, Image sampling and quantization, Color Fundamentals, Color Models, Pseudo-color image processing.

08Hours

Module – II

Image Enhancement In The Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

08Hours

Module – III

Image Enhancement In Frequency Domain: Introduction, Fourier Transform, Discrete Fourier Transform (DFT), properties of DFT , Discrete Cosine Transform (DCT), Image filtering in frequency domain

08Hours

Module – IV

Image Segmentation: Introduction, Detection of isolated points, line detection, Edge detection, Edge linking, Region based segmentation- Region growing, split and merge technique, local processing, regional processing, Hough transform, Segmentation using Threshold.

08Hours

Module – V

Image Compression: Introduction, coding Redundancy , Inter-pixel redundancy, image compression model, Lossy and Lossless compression, Huffman Coding, Arithmetic Coding, LZW coding, Transform Coding, Sub-image size selection, blocking, DCT implementation using FFT, Run length coding

08Hours

Course Outcomes:

On completion of this course, students will be able to :

• Explain fundamentals of image processing

• Compare transformation algorithms

• Contrast enhancement, segmentation and compression techniques

Text Book:

1. Rafael C. Gonzalez and Richard E. Woods: "Digital Image Processing, 3rdEdition, Pearson Education, Pearson Education, 2014, ISBN-10: 9332518467, ISBN-13: 9789332518469,

Reference Books:

1. S Jayaraman, S Esakkirajan, T Veerakumar: "Digital Image Processing", Tata Mc- Graw HillPublication.

2. S Sridhar: "Digital Image Processing", Oxford University Press, ISBN-10: 0199459355, ISBN- 13:9780199459353.

E-Resources:

1. https://www.abebooks.com/9789332518469/Digital-Image-Processing-3rd-Edi-tion-9

2. www.synergy.ac.in/intranet/classnotes/introduction.pdf

COMPUTER VISION

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST662	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PEC

Prerequisites:
Computer graphics, drawing and animation Image processing techniques

Course Objectives:
Upon Completion of the course, the students will be able to
- Recall image processing techniques for computer vision
- Do shape and region analysis
- Elucidate Hough Transform and its applications to detect lines, circles, ellipse
- Apply three-dimensional image analysis techniques
- Exploit motion analysis
- Study real world applications of computer vision algorithms

Module - I

Image Processing Foundations
Fundamentals Of Image Processing Techniques – Classical Filtering Operations – Thresholding Techniques – Edge Detection Techniques – Corner And Interest Point Detection –Mathematical Morphology –Texture

08 Hours

Module - II

Shapes and Regions
Binary Shape Analysis – Connectedness – Object Labeling And Counting – Size Filtering – Distance Functions – Skeletons And Thinning – Deformable Shape Analysis – Boundary Tracking Procedures – Active Contours – Shape Models And Shape Recognition – Centroidal Profiles – Handling Occlusion – Boundary Length Measures – Boundary Descriptors – Chain Codes – Fourier Descriptors – Region Descriptors – Moments

08Hours

Module - III

Hough Transform

Line Detection – Hough Transform (HT) For Line Detection – Foot-of-Normal Method – Line Localization – Line Fitting – RANSAC For Straight Line Detection – HT Based Circular Object Detection – Accurate Center Location – Speed Problem – Ellipse Detection – Case Study: Human Iris Location – Hole Detection – Generalized Hough Transform – Spatial Matched Filtering – GHT For Ellipse Detection – Object Location – GHT For Feature Collation

08Hours

Module - IV

3D Vision and Motion

Methods For 3D Vision – Projection Schemes – Shape From Shading– Photometric Stereo – Shape From Texture – Shape From Focus – Active Range Finding – Surface Representations – Point-Based Representation – Volumetric Representations – 3D Object Recognition – 3D Reconstruction – Introduction To Motion – Triangulation – Bundle Adjustment – Translational Alignment – Parametric Motion – Spline-Based Motion – Optical Flow – Layered Motion

08Hours

Module - V

Applications

Application: Content Based Image Retrieval, Content Based Video Retrieval. Case Study: Face Recognition, Gait Recognition.

08Hours

Text Books:

1. E. R. Davies, (2012), ‚Computer & Machine Vision', Fourth Edition, Academic Press.
2. R.Szeliski,(2011),ComputerVision:AlgorithmsandApplications',Springer2011.
3. Simon J. D. Prince, (2012) ‚Computer Vision: Models, Learning, and Inference', Cambridge University Press, 2012.
4. MarkNixonandAlbertoS.Aquado,(2012),FeatureExtraction&ImageProcessing for Computer Vision', Third Edition, Academic Press.

Reference Books:

1. D.L.Baggioetal.,(2012),MasteringOpenCVwithPracticalComputerVision Projects', Packet Publishing,.
2. JanErikSolem,(2012),Programming Computer Vision with Python: Tools and algorithms for analyzing images', O'Reilly Media.

Course Outcomes:

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Level of learning Domain
CO1	Explain the basic image processing techniques	L2
CO2	Interpret in-shape , boundary tracking and apply chain codes in region detection	L2
CO3	Apply hough transform for detection of geometric shapes like line, ellipse and objects.	L3
CO4	Illustrate 3D vision process and motion estimation techniques	L2
CO5	Apply computer vision in real time scenario.	L3

DEVOPS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST663	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PEC

Course objectives:
This course will enable students to:
➢ Understand the DevOps Concepts and DevOps Tool.
➢ Expose to the evolving Applications and advance features of Jenkins and Docker.
➢ Get Familiarize with Docker and Chef workstations.
➢ Understand the importance of testing using Jenkins, AWS EC2.
➢ Identify and understand security in Jenkins and monitor the azure Applications.

Syllabus

Module – I
Introduction to DevOps Concepts: Understanding DevOps movement, DevOps with changing times, The waterfall model, Agile Model, Why DevOps? DevOps lifecycle, Benefits of DevOps.

08Hours

Module – II
Continuous Integration with Jenkins 2: Introduction, Installing Jenkins, Jenkins dashboard, Configuration Java, Maven/Ant in Jenkins, Creating and Configuring build job for Java application with Maven, Managing Nodes, Email notifications based on build status.

08 Hours

Module – III
Containers: Overview of Docker containers, Understanding the difference between virtual machines and containers, Installing and configuring Docker, Creating a Tomcat container.
Cloud Computing and Configuration Management: An overview of the Chef Configuration management tool, Installing and configuring a Chef workstation, Installing knife plugins for Amazon Web Services and Microsoft Azure.

08 Hours

Module – IV
Automated Testing (Functional and Load Testing): Functional testing using Selenium, Functional test execution in Jenkins, Load test execution using Jenkins. **Orchestration - End-to-End Automation:** End-to-end automation of application life cycle management using Jenkins, End-to-end automation using Jenkins, Chef, and AWS EC2, End-to-end automation using Jenkins and AWS Elastic Beanstalk, End-to end automation using Jenkins and Microsoft Azure app services, End-to-end automation orchestration of application life cycle Management using VSTS.

08 Hours

Module – V
Security and Monitoring: Security in Jenkins and VSTS, Security in Jenkins and VSTS, Monitoring
Jenkins and Microsoft Azure, Monitoring Jenkins, Azure Web Apps troubleshooting and monitoring, Azure App Services - CPU and memory consumption, Azure App Services - Activity log, Azure Application Insights for application monitoring, Azure web application monitoring, Diagnostics logs.

08 Hours

Course outcomes:
On completion of this course, the students are able to:
CO1: Understand the fundamentals of DevOps engineering and be fully proficient with DevOpsterminologies, concepts, benefits, and deployment options to meet your business requirements
CO2: Build jobs and configurations in Jenkins and Master in docker , Continuous Delivery and chef Configuration Management.
CO3: Create tomcat container and work on Dockers and chef workstation.
CO4: Analyse, design and evaluate automation scripts & systems.
CO5: Use Azure application services and monitor the security issues in Jenkins and Microsoft Azure.

Text Books:
1) Mitesh Soni: DevOps for Web Development, Packet Publishing, ISBN:9781786465702, Released October 2016
2) Mitesh Soni: DevOps Bootcamp-A fast-paced guide to implement DevOps with ease, May2017(Chapters: 3,4,6,7,8),ISBN 978-1-78728-596-5.

Reference Books
1) Len Bass, Ingo Weber, Liming Zhu, Devops Software Architect's perspective, first edition, ISBN 978-0-13-404984-7,2015 Pearson Education, Inc.
2) Trevor Roberts, Jr., Josh Atwell, Egle Sigler, Yvo van Doorn, Devops for VMware Administrator, First Printing: April 2015, ISBN-10: 0-13-384647-4, ISBN-13: 978-0-13-384647-8, Pearson Education, Inc.
3) Sanjeev Sharma "The DevOps Adoption Playbook: A Guide to Adopting DevOps in a Multi-Speed IT Enterprise" Published by John Wiley & Sons, Inc. ISBN: 978-1-119-30874-4, ISBN:978-1-119-31052-5 (eBook) ,ISBN: 978-1-119-31076-1 (eBook)

E-Recourses
1) https://resources.collab.net/devops-101/what-is-devops.
2) https://www.ibm.com/cloud/learn/devops-a-complete-guide.
3) https://newrelic.com/devops/what-is-devops
4) https://www.oreilly.com/library/view/devops-for-web/9781786465702/

ENVIRONMENTAL STUDIES					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
20ENV57/67	1:0:0:0	1	CIE:50 SEE:50	1 Hours	HSMC

Course Objectives: To recognize major concepts in environmental sciences and demonstrate in-depth understanding of the environment. The industrial revolution and development have led to the stress on environment in the form of pollution. Checking of the pollution in all fronts at local and global level encompassing the issues of carbon credit, ozone level depletion, global warming, desertification and polar ice cap melting. The main objectives of the course is to expose to students to the problems and mitigation measures concerned to the environmental components like resources, air, water and land.

Syllabus
Module 1:

Ecosystems (Structure and Function): Forest, Desert, Wetlands, Riverine, Oceanic and Lake.
Biodiversity: Types, Value; Hot-spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation.

3 Hours

Module 2:

Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind.
Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable Mining, Cloud Seeding, and Carbon Trading.

4 Hours

Module 3:

Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution.
Waste Management & Public Health Aspects: Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge.

4 Hours

Module 4:

Global Environmental Concerns (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.

3 Hours

Module 5:

Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications): G.I.S. & Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship- NGOs.
Field work: Visit to an Environmental Engineering Laboratory or Green Building; Visit to a local area to document environment assets river / forest / grassland / hill / mountain. Visit to a local polluted site- urban/rural/industrial/agricultural/Water Treatment Plant/ Waste water treatment Plant. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hills lopes; etc (field work equal to 2 lecture works) ought to be Followed by understanding of process and its brief documentation.

4 Hours

Course outcomes: At the end of the course, students will be able to: ·
• CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale, ·
• CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
• CO3: Demonstrate ecology knowledge of a complex relationship between biotic and a biotic components.
• CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

Sl. No	Name of the Textbook/s	Title of the Book Author/s	Name of the Publisher	Edition and Year
1	Environmental Studies	Benny Joseph	Tata Mc Graw – Hill.	2nd Edition, 2012
2	Environmental Studies	S M Prakash	Pristine Publishing House, Mangalore	3rd Edition, 2018
3	Environmental Studies – From Crisis to Cure	R Rajagopalan	Oxford Publisher	2005
4.	Environmental Studies	R. Geetha Balakrishna, K. G. Lakshminarayana Bhatta	SM Publications.	2016
Reference Books				
1	Principals of Environmental Science and Engineering	Raman Sivakumar	Cengage learning, Singapur.	2nd Edition, 2005
2	Environmental Science – working with the Earth	G. Tyler Miller Jr.	Thomson Brooks /Cole,	11th Edition, 2006
3	Text Book of Environmental and Ecology	Pratiba Sing, Anoop Singh & Piyush Malaviya	Acme Learning Pvt. Ltd. New Delhi.	1stEdition

RESEARCH METHODOLOGY

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST68	2:0:0:0	2	CIE:50 SEE:50	3 Hours	AEC

Course objectives:

1. To give an overview of the research methodology and explain the technique of defining a research problem
2. To explain the functions of the literature review in research.
3. To explain carrying out a literature search, its review, developing theoretical and conceptual frame works and writing areview and research reports.
4. To explain various Testing of Hypotheses and statistical analysis.
5. To discuss techniques of Interpretation and effective Report Writing.

Syllabus

Module-I

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Types of Research, Research Approaches,Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India.

Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem,Technique Involved in Defining a Problem, An Illustration.

Module-II

Reviewing the literature: Place of the literature review in research, bringing clarity and focus to research problem, improving research methodology, broadening knowledge base in research area, enabling contextual findings, Review ofthe literature, searching the existing literature, reviewing the selected literature, developing a theoretical framework, developing a conceptual framework, writing about the literature reviewed.[Book 2, Chapter 3].

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of ExperimentalDesigns, Important Experimental Designs.

Module-III

Design of Sample Surveys: Design of Sampling: Introduction, Sample Design, Sampling and Non Sampling Errors,Sample Survey versus Census Survey, Types of Sampling Designs.

Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement, Techniques of Developing Measurement Tools, Scaling, Scale Classification Bases, Sca ling Technics, Multidimensional Scaling, Deciding the Scale.

Module-IV

Data Collection: Introduction, Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data,Selection of Appropriate Method for Data Collection, Case Study Method.

Testing of Hypotheses: Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis.

Module-V

Chi-square Test: Test of Difference of more than Two Proportions, Test of Independence of Attributes, Test of Goodness of Fit, Cautions in Using Chi-Square Tests.

Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

Course Outcomes (Course Skill Set)

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

CO1. Explain the meaning of engineering research.

CO2. Explore the procedure of Literature Review and Technical Reading.

C03. Explain the fundamentals of Testing of Hypotheses and statistical analysis.

CO4. Explore the techniques of Interpretation and effective Report Writing.

CO5. Comprehend the basic principles of research methodologies.

Textbooks

1   C. R. Kothari, G aurav Garg, "Research Methodology: Methods and Techniques", 4th Edition, 2019, New Age International Publication

2   Ranjit Kumar, "Research Methodology a Step-By- Step Guide For Beginners", 3rd Edition, 2011, SAGE Publications Ltd,

Reference Book

1   David V. Thiel, "Research Methods for Engineers", Cambridge University Press, 2020

Online Resources

https://onlinecourses.nptel.ac.in/noc22_ge08/preview

https://archive.nptel.ac.in/courses/127/106/127106227/

https://onlinecourses.swayam2.ac.in/cec20_hs17/preview

https://archive.nptel.ac.in/courses/110/105/110105139/