CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
Kokapet (Village), Gandipet, Hyderabad, Telangana-500075. www.cbit.ac.in

COMMITTED TO RESEARCH, INNOVATION AND EDUCATION 43 years

SCHEME OF INSTRUCTION AND SYLLABI

of

BE V to VI SEMESTERS

of

FOUR YEAR DEGREE COURSE

in

B.E. – INFORMATION TECHNOLOGY

(AICTE Model Curriculum with effect from AY 2020-21)

R-20 Regulation

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instruction of V Semester of B.E. – Information Technology as per AICTE Model Curriculum, w.e.f: 2022-23

DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER -V

S.No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	20ITC19	Operating Systems	3	-	3	40	60	3
2	20ITC20	Computer Networks	3	-	3	40	60	3
3	20ITC21	Basic Machine Learning	3	-	3	40	60	3
4	20ADC07	Full Stack Development	3	-	3	40	60	3
5		Professional Elective - 2	3	-	3	40	60	3
PRACTICALS								
6	20ITC22	Networks and Security Lab	-	3	3	50	50	1.5
7	20ITC23	Basic Machine Learning Lab	-	3	3	50	50	1.5
8	20ADC09	Minor Project-I (Full Stack Development Lab)	-	3	-	50	-	1.5
9	20ITI02	Industrial / Rural Internship-II	90 Hours		-	-	-	2
TOTAL			**15**	**9**		**350**	**400**	**21.5**

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**
CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

Professional Elective-2		
S.No.	**Course Code**	**Course Name**
1.	20ITE05	Information Retrieval Systems
2.	20ITE06	Advanced Databases
3.	20ITE07	Augmented Reality and Virtual Reality

4.	20ITE08	Cyber Security
5.	20ITE09	Software Project Management

20ITC19 **OPERATING SYSTEMS**

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To familiarize students with various services provided by an operating system.
2. To introduce the concepts of process, process synchronization and process scheduling.
3. To deal with different approaches of memory management.
4. To facilitate understanding of the structure and organization of the file system.
5. To provide understanding of Protection and security aspects of operating systems

Course Outcomes:

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

1. Demonstrate operating system services, inter process communication and multithreaded Programming.
2. Apply suitable process scheduling, deadlocks handling algorithms and solve process-synchronization.
3. Make use of advanced techniques such as paging, segmentation and virtual memory for memory management.
4. Illustrate file system interfaces and its implementation.
5. Identify the Operating System Security problems and Threats.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	1	1	-	-	-	1	1	1	1	3	3	3
CO2	2	1	2	1	2	-	-	-	-	-	1	-	3	-	2
CO3	2	1	2	2	1	-	-	-	-	-	-	-	3	-	3
CO4	2	1	1	1	1	-	-	-	-	-	-	1	3	-	1
CO5	2	1	1	1	1	-	-	-	-	-	-	1	3	-	1

UNIT–I

Introduction: Definition of Operating System, Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments, Open-Source Operating Systems.

Operating System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, System Boot.

Process: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication.

Threads: Overview, Multicore Programming, Multithreading Models, Threading Issues.

UNIT–II

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling.

Synchronization: Background, The Critical-Section Problem, Peterson ‘s Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT–III

Memory Management Strategies: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table.

Virtual Memory Management: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory.

UNIT–IV

File-System: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing Protection.

Implementing File Systems: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance.

Mass-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management.

UNIT–V

System Protection: Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of the Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems **System Security:** The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication.

Text Book:

1. Abraham Silberschatz, Peter Galvin, Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Pvt Ltd, 2018.

Suggested Reading:

1. A.Tanenbaum, "Modern Operation Systems", 3rd Edition, Pearson Education, 2008.
2. William Stallings, "Operating Systems", 5th Edition, Pearson Education, 2005.
3. Ida M.Flynn, "Understanding Operating Systems", 6th Edition, Cengage, 2011.
4. D.M.Dhamdhere, "Operating systems a concept-based approach", 2nd Edition, McGraw-Hill, 2007.

Web Resources:

1. https://www.os-book.com/OS10/
2. http://nptel.ac.in/downloads/106108101/
3. http://www2.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/
4. http://www.cs.kent.edu/~farrell/osf03/oldnotes/

20ITC20 **COMPUTER NETWORKS**

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. Familiarize students with the basics of Layering of services, data transmission, transmission media, data Communication System and its components.
2. Provide state-of-the-art knowledge on Network Layer issues including Routing, Addressing.
3. Give an overview of how Networks differ and how they can be interconnected.
4. Introduce IP based transport protocols TCP and UDP.
5. Give an insight into the working principles of popular Internet Applications including Email, Domain Name System, WWW, Streaming audio and video.

Course Outcomes:

Upon successful completion of this course, students will be able to

1. Summarize functions of each layer in the OSI and TCP/IP reference models and demonstrate the systematic understanding of data communication Techniques.
2. Solve problems related to Addressing, Routing and Interoperability among heterogeneous networks.
3. Identify issues in Internetwork Routing issues and Congestion in computer networks.
4. Appraise the functions and performance of Internet Transport Protocols TCP and UDP.
5. Analyze the operating principles of Domain Name System and Electronic Mail, WWW.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	-	-	-	-	-	-	-	2	3	3	3
CO2	3	3	2	1	-	-	-	-	-	-	-	2	3	3	2
CO3	3	3	2	1	-	-	-	-	-	-	-	2	3	3	3
CO4	3	3	2	2	-	-	-	-	-	-	-	2	3	3	2
CO5	3	3	2	2	-	-	-	-	-	-	-	2	3	3	3

UNIT-I

Introduction: Concept of layering, Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, **The Data Link Layer**: Framing, Error Control – Flow Control, Error Detection and Correction – Error-Correcting Codes – Error Detecting Codes, Sliding Window Protocols. **Channel allocation methods:** Assumptions for dynamic channel allocation, Carrier Sense Multiple access protocols, Collision free protocols. **Ethernet:** MAC Sublayer Protocol, Switched Ethernet, Fast Ethernet, Gigabit Ethernet, 10-Gigabit Ethernet.

UNIT-II

Network layer Routing Algorithms: Design Issues, Routing Algorithms-Shortest path, Flooding, Flow based Distance vector, Link state Routing.

The Network Layer in The Internet: IP Version 4 Protocol, IP Addresses, IP Version 6, Internet Control Protocols, Label Switching and MPLS, Internet Multicasting, **Internetworking:** Different networks, Connection of networks, Tunneling, Packet Fragmentation.

UNIT-III

The Transport Layer: Berkeley Sockets, Elements of transport protocols – Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, Multiplexing, Crash Recovery.
Congestion Control: Desirable Bandwidth Allocation, Regulating the Sending Rate.

UNIT-IV

The Internet Transport Protocols: UDP-Introduction to UDP.
The Internet Transport Protocols: TCP- Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Connection Management Modeling, TCP Sliding Window, TCP Timer Management, TCP Congestion Control.

UNIT-V

Application Layer: DNS—The Domain Name System, The DNS Name Space, Domain Resource Records, Name Servers. **Electronic MAIL:** Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery. **The World Wide Web** - Architectural Overview. **Streaming Audio and Video:** Streaming Stored Media, Streaming Live Media. Content Delivery.

Text Books:

1. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", 5th Edition, Pearson Education, 2014.
2. W. Richard Stevens, "Unix Network Programming", Prentice Hall/Pearson Education, 2009.

Suggested Reading:

1. Chwan-Hwa (John) Wu, J. David Irwin, "Introduction to Computer Networks and Cyber Security", CRC Press, 2013.
2. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", 5th Edition, Addison-Wesley, 2012.

Web Resources:

1. https://nptel.ac.in/courses/117105148
2. https://www.ibm.com/docs/en/i/7.1?topic=communications-socket-programming

20ITC21 **BASIC MACHINE LEARNING**

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To impart knowledge on the basic concepts of machine learning.
2. To familiarize different machine learning techniques.
3. To learn various Classification and Regression algorithms.
4. To familiarize various Kernels, SVMs and Ensemble methods.
5. To facilitate Dimensionality Reduction and Clustering.

Course Outcomes:

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

1. Explain the types of machine learning and handle the challenges of machine learning.
2. Construct Decision Trees, Measure performance of classifiers.
3. Apply Regression, Logistic Regression and gradient descent to solve problems.
4. Design solutions using Bayesian classifier, SVMs and Ensemble methods.
5. Perform Dimensionality reduction and clustering of data.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	1	-	2	-	-	-	-	-	-	-	1	-	-	-
CO2	1	1	1	1	-	-	-	-	-	-	-	1	2	3	2
CO3	2	2	1	2	1	-	-	-	-	-	1	1	2	3	2
CO4	2	2	1	2	1	-	-	-	-	-	1	1	2	3	2
CO5	2	2	1	2	1	-	-	-	-	-	1	1	2	3	2

UNIT-I

The Machine Learning Landscape: What Is Machine Learning, Why Use Machine Learning, Examples of Applications, *Types of Machine Learning Systems:* Supervised/Unsupervised Learning, Batch and Online Learning, Instance-Based Versus Model-Based Learning, *Main Challenges of Machine Learning:* Insufficient Quantity of Training Data, Non representative Training Data, Poor-Quality Data, Irrelevant Features, Overfitting the Training Data, Under fitting the Training Data, Stepping Back, *Testing and Validating:* Hyperparameter Tuning and Model Selection , Data Mismatch.

UNIT-II

Classification: Training a Binary Classifier, *Performance Measures:* Measuring Accuracy Using Cross-Validation, Confusion Matrix, Precision and Recall, Precision/Recall Trade-off, The ROC Curve, Multiclass Classification. **Decision Trees:** Training and Visualizing a Decision Tree, Making Predictions, Estimating Class Probabilities, The CART Training Algorithm, Computational Complexity, Gini Impurity or Entropy? Regularization Hyperparameters, Regression, Instability.

UNIT-III

Regression: *Linear Regression*: The Normal Equation, Computational Complexity, *Gradient Descent:* Batch Gradient Descent, Stochastic Gradient Descent, Mini-batch Gradient Descent, Polynomial Regression, Learning

Curves, *Regularized Linear Models:* Ridge Regression, Lasso Regression, Elastic Net, Early Stopping, *Logistic Regression:* Estimating Probabilities, Training and Cost Function, Decision Boundaries, Softmax Regression.

UNIT-IV

Support Vector Machines: Linear SVM Classification, Soft Margin Classification, *Nonlinear SVM Classification:* Polynomial Kernel, Similarity Features, Gaussian RBF Kernel, Computational Complexity, SVM Regression, *Under the Hood:* Decision Function and Predictions, Training Objective, Kernelized SVMs. **Bayes Classification:** Maximum Posteriori, Bayes Belief Networks.

UNIT-V

Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Kernel PCA, **Unsupervised Learning Techniques:** *Clustering:* K-Means, Limits of K-Means, Using Clustering for Image Segmentation, DBSCAN, Other Clustering Algorithms, Gaussian Mixtures. **Ensemble Learning and Random Forests:** Voting Classifiers, Bagging and Pasting, Random Patches and Random Subspaces, Random Forests, Boosting.

Text Books:

1. Aurelien Geron, "Hands-on Machine Learning with Scikit-Learn, Keras & TensorFlow"- Concepts, Tools, and Techniques to Build Intelligent Systems, 2nd edition, O'Reilly,2019

Suggested Reading:

1. Tom Mitchel, "Machine Learning", Tata McGraW Hill, 2017.
2. Stephen Marshland, "Machine Learning: An Algorithmic Perspective", CRC Press Taylor & Francis, 2nd Edition, 2015

Web Resources:

1. https://www.coursera.org/specializations/machine-learning

20ADC07 **FULL STACK DEVELOPMENT**

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To provide knowledge about web pages design and development.
2. To understand how the HTML, CSS and JavaScript components of Bootstrap work.
3. To explore the basic architecture of a React application and develop applications in agile mode.
4. To gain the basics of frond-end and back-end application development using Nodejs.
5. To understand the basics of MongoDB and its Data Model.

Course Outcomes:

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

1. Create web pages with good aesthetic sense of design using HTML and CSS.
2. Create real-world React web applications and related tools.
3. Become an agile practitioner with the ability to quickly complete projects.
4. Build an end-to-end application from scratch using NODE JS.
5. Understand and build logical relationships between documents using MongoDB.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	3	1	1	-	-	-	1	1	1	1	3	2	3
CO2	2	1	2	1	2	-	-	-	-	-	1	-	2	2	3
CO3	2	1	2	2	1	-	-	-	-	-	-	-	3	3	3
CO4	2	1	1	1	1	-	-	-	-	-	-	1	1	3	3
CO5	2	1	1	1	1	-	-	-	-	-	-	1	1	3	3

UNIT-I

Introduction: Web Fundamentals, **HTML 5.0:** Basic tags, Images, Tables, Lists, Forms, Layout, Graphics, span and div tags.

Introduction to Cascading Style Sheets: Types of CSS**, text and font, color,** CSS Selectors, CSS BOX Model, CSS Positioning, and CSS floating, CSS Grid layout Module.

UNIT-II

Java Script: Data Types & Type Conversion, JSON, Events, String and Date Functions, Object Oriented Programming (OOP) in JS, Document Object Model, JavaScript Regular Expressions.

Bootstrap: Introduction of Bootstrap, Container and Container-fluid, Connectivity of Bootstrap in page. **Bootstrap Component**: Jumbotron, Button, Grid, Table, Form, Alert, Panels, Image, Progress Bar, Tabs/Pill, Navbar, Modals.

UNIT-III

React JS: Basics, State, Props, Components, Lifecycle, Events, Router, Forms, Tables, Portals, ES6, CSS, Hook, and Back End Integration.

Express JS: The model-view-controller pattern, Defining EJS template Engine Building a front-end controller, defining routes, creating actions, Configuring Express to use EJS, Using REST, Reading POST data Adding middleware .

UNIT-IV

Node JS Modules: Functions, Buffer, Modules, Modules Types, Core Module, Local Modules and Modules Exports
Node Package Manager: What is NPM? Installing Packages Locally, installing package globally, adding dependency in package Json and Updating packages.
Creating Web Server: Creating Web Server, Sending Requests and Handling HTTP requests.
File System: Read File, writing a File, opening a File Deleting a File, Writing a file asynchronously and Other I/O Operations.
Events: Event Emitter class, Inheriting Events and Returning event emitter.

UNIT-V
Mongo DB: Introduction, Importance of NoSQL databases, JSON features, Data types and examples. CRUD Operations, Data Modelling & Schema Design, Indexing and Aggregation, Mongo Import/Export and Master/Slave Replication.

Text Books:
1. Vasan Subramanian, "Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node", second Edition, Apress Publications, 2019.
2. David Hows, Peter Membrey, EelcoPlugge – "MongoDB Basics", Apress, 2014.

Suggested Reading:
1. Ethan Brown, "Web Development with Node and Express", Oreilly Publishers, First Edition, 2014.

Web Resources:
1. https://web.stanford.edu/class/cs142/index.html
2. https://nodejs.org/en/docs/
3. https://www.mongodb.com/
4. https://reactjs.org/
5. https://getbootstrap.com/docs/5.0/utilities/api/
6. https://edu.anarchocopy.org/Programming%20Languages/Node/Pro%20MERN%20Stack,%202nd%20Edition.pdf

20ITC22 **NETWORKS AND SECURITY LAB**

Instruction	3 P Hours per week
Duration of SEE	3 Hours
CIE	50 Marks
SEE	50 Marks
Credits	1.5

Course Objectives:

1. To provide knowledge required to implement error detection, network routing algorithms and analyse traffic flow of the contents.
2. To present Client/Server applications based on TCP, UDP and SMTP using Java Socket API.
3. To facilitate knowledge required to handle rootkits, capture packets & interfaces.
4. To deal with the configuration and use of technologies designed to segregate the organization‘s systems from the insecure Network.
5. To familiarize with security policies of tcpdump, dumpcap and pentest tools using nmap.

Course Outcomes:

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

1. Identify Errors using CRC, Implement routing algorithms and congestion control algorithms.
2. Demonstrate client-server communication using TCP, UDP protocols.
3. Experiment with rootkits to detect malware, wire shark to capture the packets and interfaces.
4. Make use of tools, techniques to protect the system from attacks.
5. Acquire thorough knowledge on tcpdump, dumpcap and nmap.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	3	-	-	-	-	-	-	1	3	3	3
CO2	3	3	2	2	3	-	-	-	-	-	-	1	3	3	2
CO3	2	2	2	3	3	3	1	-	-	-	-	-	3	3	3
CO4	2	2	2	3	3	3	1	-	-	-	-	-	3	3	2
CO5	2	2	2	3	3	3	1	-	-	-	-	-	3	3	3

LIST OF PROGRAMS

1. Implement CRC Error detection technique.
2. Implement Dijkstra‘s and Distance Vector routing algorithms.
3. Implement congestion control using leaky bucket & Token bucket Algorithms.
4. Implementation of TCP (Server and client) and UDP (Server and client) .
5. Implement SMTP protocol.
6. Installation of rootkits and study about the variety of options.
7. Implement Wireshark to capture the packets and interfaces.
8. Demonstrate intrusion detection system using SNORT tool or any other software.
9. Setup a honey pot and monitor the honeypot on network using KF sensor.
10. Demonstrate how to managing securing policies using tcpdump, dumpcap using Wireshark.
11. Demonstration of pentest tools using Nmap, Wireshark.

Note:- Implement Programs 1 to 5 in C or Java

Text Books:

1. Andrew S. Tanenbaum, Computer Networks, Pearson Education,6th Edition,2021.
2. Michael Gregg, "Build Your Own Security Lab", Wiley Publishing, Inc., 2008.
3. Michael E.whitman, Herbert J.Mattord, Andrew Green ,"Hands on Information Security lab manual", Cengage Learning, Fourth edition, December 27, 2013.

Suggested Reading:

1. James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", 8th Edition, Pearson Education, 2022.
2. Alfred Basta, Wolf Halton, "Computer Security, concepts, issues and implementation", Cengage Learning India Pvt. Ltd, 2008.

Web Resources:

1. https://nmap.org
2. https://www.snort.org
3. https://www.wireshark.org
4. http://www.keyfocus.net/kfsensor/
5. http://www.gmer.net/

20ITC23 **BASIC MACHINE LEARNING LAB**

Instruction	3 L Hours per week
Duration of SEE	3 Hours
CIE	50 Marks
SEE	50 Marks
Credits	1.5

Course Objectives:

1. To impart knowledge of dimensionality reduction and clustering techniques.
2. To introduce the concept of decision tree for supervised learning.
3. To familiarize with Bayesian decision theory and probabilistic methods.
4. To introduce the concept of SVM.
5. To familiarize with ensemble methods.

Course Outcomes:

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

1. Perform dimensionality reduction of a dataset.
2. Build decision trees for classification.
3. Design solutions using SVM, KNN, Regression algorithms.
4. Perform clustering of data.
5. Use principle Component Analysis for feature Extraction.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	1	2	1	-	-	-	-	-	-	-	1	-	2
CO2	1	1	-	2	1	-	-	-	-	-	-	-	2	-	2
CO3	2	1	1	2	2	-	-	-	-	-	-	-	2	-	2
CO4	1	2	1	2	1	-	-	-	-	-	-	-	2	-	2
CO5	2	1	-	2	1	-	-	-	-	-	-	-	2	-	2

LIST OF PROGRAMS

1. a) Vectors, Matrices, and Arrays representation, Loading of data
   b) Data Wrangling, Handling Numerical and Categorical Data
2. Dimensionality Reduction Using Feature Extraction, Feature Selection
3. Linear Regression, Nonlinear Regression, Ridge Regression, Esso Regression, Logistic Regression
4. Decision Trees and Random Forest
5. K-Nearest Neighbors
6. Support Vector Machines
7. Naive Bayes classifier
8. Principle Component Analysis
9. Clustering using K-Means, DBSCAN, Hierarchical Merging
10. Model Selection, Saving and Loading Trained Models.

Text Book:

1. Aurelien Geron, "Hands-on Machine Learning with Scikit-Learn, Keras, and Tensor Flow", O'Reilly Media, 2nd Edition, 2019.

Suggested Reading:

1. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", Cambridge University Press, 1st Edition, 2012.

Datasets:

1. https://www.kaggle.com/datasets
2. https://www.csie.ntu.edu.tw/~cjlin/libsvmtools/datasets/multilabel.html#siam-competition2007

Web Resource:

1. https://www.coursera.org/specializations/machine-learning

20ADC09 **MINOR PROJECT- I**

(Full Stack Development Lab)

Instruction	3 L Hours per week
Duration of SEE	-
SEE	-
CIE	50 Marks
Credits	1.5

Course Objectives:

1. To enable students to learn by doing.
2. To develop capability to analyze and solve real world problems.
3. To inculcate innovative ideas of the students.
4. To impart team building and management skills among students.
5. To instill writing and presentation skills for completing the project.

Course Outcomes:

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

1. Interpret Literature with the purpose of formulating a project proposal.
2. Plan, analyze, Design and implement a project.
3. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios.
4. Plan to work as a team and to focus on getting a working project done and submit a report within a stipulated period of time.
5. Prepare and submit the Report and deliver a presentation before the departmental Committee.

Minor Project is aimed to enable the students to develop a product/application based on the course **FULL STACK DEVELOPMENT** with course code- **20ADC07**. The student has to implement and present the project as per the given schedule. During the implementation of the project, Personnel Software Process (PSP) has to be followed. Report of the project work has to be submitted for evaluation.

SCHEDULE

S No	Description	Duration
1.	Problem Identification / Selection	1 week
2.	Preparation of Abstract	1 week
3.	Design the Web Pages using advanced HTML Form tags input–date, time, number, email, HTML5 Header and Footer, spell check and editable areas.	1 week
4.	Demonstrate the CSS tags Inline, Internal and External Style sheets using advanced CSS in web pages	1 week
5.	Demonstrate JavaScript to perform validation and Bootstrap in Front-End Design.	1 week
6.	Implement React JS, MVC Pattern and Node JS Features in the application.	2 weeks
7.	Implement CRUD operations/DB Replication in MongoDB.	2 weeks
8.	Implementation and inferences	2 weeks

9.	Documentation and Project Presentation	2 weeks

Guidelines for the Award of marks

S No	Description	Max. Marks
Final Assessment		
1.	PPT Preparation	10
2.	Technical Content	10
3.	Question and Answers	5
4.	Report Preparation	5
Total		**30**

Final Minor Project demonstration and PPT presentation is to be evaluated for the entire class together by all the faculty handling Minor Project for that class.

20ITE05 **INFORMATION RETRIEVAL SYSTEMS**

(Professional Elective –2)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To familiarize with different Information Retrieval models.
2. To learn query languages for data retrieval.
3. To introduce various methods for efficient retrieval of information.
4. To impart knowledge on text operations.
5. To introduce Parallel and Distributed IR models.

Course Outcomes:

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

1. Understand different Information Retrieval models.
2. Apply query language to retrieve the data and evaluate performance.
3. Analyze various methods to improve the retrieval results.
4. Perform operations on text and build indices.
5. Analyze searching techniques and understand Parallel and Distributed IR models.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	2	-	-	-	-	-	1	-	1	2	1	1
CO2	3	2	1	2	-	-	-	-	-	-	-	2	2	1	2
CO3	1	1	1	1	1	2	1	1	1	1	1	1	1	3	2
CO4	3	2	1	2	-	-	-	-	-	-	-	2	2	2	2
CO5	2	2	1	2	-	-	-	-	-	-	-	2	2	1	2

UNIT-I

Introduction: Basic concepts, Past, Present and Future of IR, The Retrieval Process.

Modeling: Introduction, A Taxonomy of IR Models, Retrieval: Adhoc and Filtering, A formal characterization of IR Models, Classic Information Retrieval, Alternative Set Theoretic Models, Alternative Algebraic Models, Alternative Probabilistic Models.

UNIT-II

Structured Text Retrieval Models, **Models for Browsing**

Retrieval Evaluation: Introduction, Retrieval Performance Evaluation, Reference Collections

Query languages: Introduction, Keyword-based querying, pattern Matching, Structural Queries, Query Protocols

UNIT-III

Query operations: Introduction, User Relevance Feedback, Automatic Local Analysis, Automatic Global Analysis

Text and Multimedia Languages and Properties: Introduction, Metadata, Text, Markup Languages, Multimedia

UNIT-IV
Text Operations: Introduction, Document Preprocessing, Document Clustering, Text Compression, Comparing Text Compression Techniques **Indexing:** Introduction, Inverted Files, Other Indices for Text, Boolean Queries

UNIT-V
Searching: Sequential Searching, Pattern Matching, Structural Queries, Compression
Parallel and Distributed IR: Introduction, Parallel IR, Distributed IR.

Text Book:

1. Ricardo, Baeza-yates, BerthierRibeiro-Neto, "Modern Information Retrieval", Pearson Education, 2008.

Suggested Reading:

1. Christopher D. Manning, PrabhakarRaghavan, HinrichSchütze, "Introduction to Information Retrieval", Cambridge University Press, 2009.
2. David A. Grossman, OphirFrieder, "Information Retrieval - Algorithms and Heuristics", Springer, 2nd Edition, 2004.
3. Gerald Kowalski, "Information Retrieval Systems: Theory and Implementation", Springer.
4. William B. Frakes, Ricardo Baeza- Yates, "Information Retrieval – Data Structures & Algorithms", Pearson Education, 2008.

Web Resources:

1. https://class.coursera.org/nlp/lecture
2. http://www.dcs.gla.ac.uk/Keith/Preface.html

20ITE06 **ADVANCED DATABASES**

(Professional Elective –2)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To provide basic foundation in advanced database concepts.
2. To familiarize distributed database system design.
3. To gain knowledge in query processing and transaction management in distributed database environment.
4. To acquire knowledge on query optimization principles.
5. To impart the knowledge on distributed transaction principles.

Course Outcomes:

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

1. Acquire knowledge on distributed, parallel and multimedia databases.
2. Distinguish the design, query processing and transaction management activities in centralized and distributed databases.
3. Apply query optimization principles for optimizing query performance in distributed database systems.
4. Utilize distributed transaction principles for handling transactions in distributed database applications.
5. Develop databases for various applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	1	1	-	-	1	1	1	1	1	2	1	1
CO2	3	3	3	1	1	-	-	1	1	1	1	1	2	1	1
CO3	2	2	2	1	1	-	-	1	1	1	1	1	1	1	1
CO4	1	1	1	1	2	-	-	1	1	1	1	1	1	1	1
CO5	2	2	3	1	1	-	-	1	1	1	1	1	2	2	2

UNIT-I

Introduction: What is a Distributed Database System?, Complications Introduced by Distribution, Distributed DBMS Architecture.

Distributed Database Design: Top-Down design process, Distribution Design Issues, Fragmentation and Allocation.

UNIT-II

Database Integration: Bottom-up design methodology, Schema Matching, Schema Integration, Schema Mapping.

Data and Access Control: View Management, Data Security.

Overview of Query Processing: Query processing problem, Objectives of Query processing, Complexity of Relational Algebra Operations, Characterization of Query Processors, and Layers of Query Processing.

UNIT-III

Query Decomposition and Data Localization: Query Decomposition, Localization of Distributed Data. **Optimization of Distributed Queries:** Query Optimization, Join Ordering in Distributed Queries, Distributed Query Optimization.

UNIT-IV

Distributed Concurrency Control: Taxonomy of Concurrency control Mechanisms, Lock-Based Concurrency Control Algorithms, Timestamp-Based Concurrency Control Algorithms, Optimistic Concurrency Control Algorithms, and Deadlock Management.

Introduction to Transaction Management: Definition of a Transaction, Properties of Transactions, Types of Transactions.

UNIT-V

Distributed DBMS Reliability: Reliability Concepts and Measures. Failures in Distributed DBMS, Local Reliability Protocols. Distributed Reliability Protocols, Dealing with Site Failures.

Parallel Database systems: Parallel Database System Architectures, Parallel Data Placement, Parallel Query Processing.

Multimedia Database Management Systems: Introduction, Multimedia storage and retrieval, Multimedia Data Access, Querying Multimedia Databases, Distributed MMDBMS Architecture**,** Introduction to Graph databases.

Text Books:

1. M T Ozsu, Patrick Valduriez, "Principles of Distributed Database Systems", Prentice Hall, third edition, 1999.
2. B.Prabhakaran "Multimedia Database Management systems", Springer International Edition, second edition, 2007.
3. Ian Robinson , Jim Webber, Emil Eifrem "Graph Databases" O'Reilly Media, Second edition, 2015.

Suggested Reading:

1. S. Ceri and G. Pelaggati, "Distributed Database System Principles and Systems", MGH, 1985.
2. M. Stonebraker, "Readings in Database Systems:, 2nd Edition, Morgan Kauffman, 1993.
3. D. Bell and J. Grimson, "Distributed Database Systems", Addison-Wesley, 1st Edition, 1992.

Web Resources:

1. https://ocw.snu.ac.kr/sites/default/files/NOTE/3076.pdf
2. http://www.inf.ed.ac.uk/teaching/courses/adbs/slides/adbs.pdf
3. https://vulms.vu.edu.pk/Courses/CS712/Downloads/Principles%20of%20Distributed%20Database%20Systems.pdf
4. https://www.technicalbookspdf.com/multimedia-database-management-systems-by-mr-b-prabhakaran/
5. https://neo4j.com/graph-databases-book/thanks/?aliId=eyJpIjoiUHBsSVA2NGpBQVwvM3kxXC9NIiwidCI6InpUVWVvSGlIUVJEaTNGRmgwWThrQXc9PSJ9

20ITE07 **AUGMENTED REALITY AND VIRTUAL REALITY**

(Professional Elective –2)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To familiarize the students with the fundamentals of Virtual Reality.
2. To impart the knowledge of 3D orientation for understanding the behavior of VR system with the environment.
3. To deal with the Development Tools and Frameworks in Virtual Reality.
4. To introduce the applications of Virtual Reality Systems.
5. To introduce technology and features of augmented reality

Course Outcomes:

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

1. Describe the basic concepts of Virtual Reality and 3D Computer Graphics.
2. Apply 3D manipulation techniques in Virtual Reality.
3. Analyze Development Tools and Frameworks in Virtual Reality.
4. Develop a Virtual Reality application.
5. Evaluate Augmented Reality Systems

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	-	2	2	-	-	-	1	-	1	3	-	1
CO2	2	2	1	1	2	2	-	-	-	1	-	1	3	-	2
CO3	2	1	1	-	1	2	-	-	1	1	-	1	3	-	1
CO4	2	2	1	2	3	2	-	-	1	1	-	1	3	-	1
CO5	2	2	1	2	3	-	-	-	1	1	-	1	3	-	1

UNIT-I

Introduction to VR and AR: History of VR and AR, Technology and Features of Augmented Reality, Comparison of AR and VR, Challenges with AR, AR Systems and Functionality, Human factors, Human visual system, Perception of depth, color, contrast, resolution, Stereo Rendering, VR Hardware: Head-coupled displays etc. VR Software, Geometric Modelling: From 2D to 3D, 3D space curves, 3D boundary representation. The Graphics Pipeline and OpenGL, Overview and Transformations, Rotation, translation, scaling, mode view matrix, projection matrix, Lighting and Shading, OpenGL Shading Language (GLSL), GLSL vertex and fragment shaders.

UNIT-II

Visual computation in virtual reality: 3D Interaction Techniques: 3D Manipulation Techniques and Input Devices, 3D Travel Tasks, Travel Techniques, Theoretical Foundations of Wayfinding, Types of Centred-Wayfinding Support, Evaluating Wayfinding Aids, System Control, Classification, Graphical Menus, Voice Commands, Gestrual Commands, Tools, Muti-modal System Control Techniques,Case Study: Mixing System Control Methods, Symbolic Input Tasks.

UNIT-III

Framing using 3D virtual reality: Development Tools and Frameworks in Virtual Reality: VR. X3D Standard; Vega, MultiGen, Virtools etc., World Space, World Coordinate, World Environment, Objects - Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment - VR Database, Tessellated Data, LODs, Graphical User Interface, Control Panel, 2D Controls.

UNIT-IV

VR applications: Pose Tracking I, Tracking with lighthouse, Pose Tracking II, Advanced positional tracking, Panoramic Imaging and Cinematic, VR Spatial Sound and the Vestibular System, VR Engines and Other Aspects of VR, Latency, eye tracking, post-rendering warp. The Future: Virtual environment, modes of interaction Application of VR in Digital Entertainment: VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games, Demonstration of Digital, Entertainment by VR.

UNIT- V

Augmented and Mixed Reality: Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

Text Books:

1. La Valle, "Virtual Reality", Cambridge University Press, 2016.
2. John Vince, “Virtual Reality Systems”, Pearson Education Asia, 2007.

Suggested Reading:

1. Alan B Craig, William R Sherman and Jeffrey D Will, ―Developing Virtual Reality Applications: Foundations of Effective Design‖, Morgan Kaufmann, 2009.
2. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013
3. Ange Anderson, Virtual Reality, Augmented Reality and Artificial Intelligence in Special Education, 2019

Web Resources:

1. https://nptel.ac.in/courses/106/106/106106138/
2. https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-ge08/
3. https://www.coursera.org/learn/ar?
4. https://www.coursera.org/specializations/virtual-reality

20ITE08 **CYBER SECURITY**

(Professional Elective –2)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To present basic concepts of Cybercrime and Cyberattacks.
2. To impart knowledge on Tools and Methods used in Cybercrime.
3. To familiarize the legal perspectives and Organizational implications of Cyber Security.
4. To present fundamentals concepts in Cyber Forensics.
5. To familiarize about regulatory framework for Cybersecurity.

Course Outcomes:

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

1. Describe legal frameworks to handle cybercrimes.
2. Identify the functioning of different kinds of malware used in cybercrimes.
3. Examine the legal perspectives of cybercrimes in Indian and international context.
4. Describe the need of Digital Forensics and the importance of digital evidence in prosecution
5. Interpret the commercial activities in the event of significant information security incidents in the Organization.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	-	-	3	-	3	-	-	2	-	3	3	1
CO2	2	3	1	2	3	3	-	3	-	-	-	-	3	3	1
CO3	2	2	1	-	-	3	-	3	-	-	-	-	3	3	1
CO4	2	3	1	2	3	3	-	3	-	-	-	-	3	3	1
CO5	2	1	1	2	-	3	-	3	-	-	2	-	3	3	1

UNIT–I

Introduction to Cybercrime: Definition and origins of the word, Cybercrime and Information security, Classification of Cybercrimes, Legal Perspectives, Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT-II

Cyber offenses: Introduction, How Criminals plan the attacks, Social Engineering, CyberStalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector.

Tools and Methods Used in Cybercrime: Introduction, Proxy servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDos Attacks, SQL Injection, Buffer Overflow,

UNIT-III

Cyber Security: The Legal Perspectives: Cyber Crime and the Legal Landscape around the World, Need of Cyber laws: the Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law, Technology and Students: The Indian Scenario.

UNIT-IV

Understanding Cyber Forensics: Introduction, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Cyber Forensics Investigation, Challenges in Computer Forensics

UNIT-V

Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Text Books:

1. Nina Godbole, Sunit Belapure, "Cyber Security Understanding Cyber Crimes, Computer forensics and Legal Perspectives", Wiley India Pvt.Ltd., 2013.
2. Harsh Bothra, "Hacking Be A Hacker with Ethics", Khanna Publishers 2017.

Suggested Reading:

1. John R Vaca "Computer Forensics: Computer crime scene Investigation", 2017.
2. Ferrera, Reder, Bird, Darrow, Aresty, Klosek, Lichtenstein, " Cyber Laws Text & Cases", 3rd Edition.
3. Tony Sammes, Brian Jenkinson, "Forensic Computing: A practitioner's Guide", Second Edition Springer International Edition.
4. Bill Nelson, Amelia Phillips, Christopher Steuart, "Guide to Computer Forensics and Investigations", Fourth Edition.

Web Resources:

1. https://www.nist.gov/
2. https://www.sans.org/
3. https://www.udemy.com/the-complete-cyber-security-course-end-point-protection/

20ITE09 **SOFTWARE PROJECT MANAGEMENT**

(Professional Elective –2)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To understand the Software Project Planning and Evaluation techniques.
2. To learn about the activity planning and risk management principles.
3. To manage software projects and control software deliverables.
4. To develop skills to manage the various phases involved in project management and people management.
5. To deliver successful software projects that support organization's strategic goals.

Course Outcomes:

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

1. Understand Project Management principles while developing software.
2. Obtain adequate knowledge about software process models and software effort estimation techniques.
3. Estimate the risks involved in various project activities.
4. Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
5. Learn staff selection process and the issues related to people management

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	-	-	1	-	-	1	2	3	-
CO2	2	1	1	-	1	-	-	-	-	-	-	1	1	3	-
CO3	2	2	1	-	-	-	-	-	-	-	2	2	2	3	2
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	3	3
CO5	2	1	-	-	-	-	-	-	1	-	-	2	2	3	3

UNIT-I

Project Evaluation and Project Planning: Importance of Software Project Management, Activities - Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT-II

Project Life Cycle and Effort Estimation: Software process and Process Models – Choice of Process models - Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II - a Parametric Productivity Model.

UNIT-III

Activity Planning and Risk Management: Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path method (CPM) – Risk identification – Assessment – Risk Planning –

Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.

UNIT-IV

Project Management and Control: Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.

UNIT-V

Staffing in Software Projects: Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

Text Book:

1. Bob Hughes, Mike Cotterell and Rajib Mall: "Software Project Management", Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

Suggested Reading:

1. Robert K. Wysocki , "Effective Software Project Managementǁ", Wiley Publication, 2011.
2. Walker Royce: ―"Software Project Management" Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, ―"Managing Global Software Projects" – McGraw Hill Education (India), Fourteenth Reprint 2013.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instruction of VI Semester of B.E. – Information Technology
as per AICTE Model Curriculum w.e.f: 2022-23

DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER –VI

S.No	Course code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	20ADC14	Big Data Analytics	3	-	3	40	60	3
2	20ITC24	Embedded Systems and IoT	3	-	3	40	60	3
3	20ADC10	Deep Learning	3	-	3	40	60	3
4	20ITC25	Cloud Computing	3	-	3	40	60	3
5		Professional Elective - 3	3	-	3	40	60	3
6	20EGM03	Universal Human Values II: Understanding Harmony	3	-	3	40	60	3
PRACTICALS								
7	20ADC15	Big Data Analytics Lab	-	3	3	50	50	1.5
8	20ITC26	Embedded Systems and IoT Lab	-	3	3	50	50	1.5
9	20ITC27	Minor Project-II (Deep Learning Lab)	-	3	-	50	-	1.5
10	20EGCO3	Employability Skills	-	2	2	50	50	1
TOTAL			**18**	**11**		**440**	**510**	**23.5**

L: Lecture **T: Tutorial** **P: Practical**
CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

Professional Elective-3		
S.No.	**Course Code**	**Course Name**
1.	20ADE03	Natural Language Processing
2.	20ITE10	Data Compression
3.	20ADE06	Microservices with Spring Boot
4.	20ITE11	Ethical Hacking

5.	20ITE12	Agile Methodologies

With effect from the Academic Year 2022-23

20ADC14 **BIG DATA ANALYTICS**

Instruction	3L Hours per week
Duration of End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce the importance of big data, role of Hadoop framework in analyzing large datasets by writing mapper and reducer for a given problem.
2. To familiarize writing queries in Pig and Hive to process big data.
3. To present latest big data frameworks and applications using Spark and Scala.
4. To discuss the concept and writing applications using SparkSQL.
5. To provide the concepts of NoSQL databases and study the working mechanisms of MongoDB.

Course Outcomes:

Upon completing this course, students will be able to:

1. Understand the processing large datasets in Hadoop framework and Apply MapReduce architecture to solve real world problems.
2. Develop scripts using Pig over large datasets and query using Hive.
3. Understand the fundamentals of Spark and the Scala programming.
4. Expertise in using Resilient Distributed Datasets (RDD) for creating applications in Spark and query using SparkSQL.
5. Understand NoSQL databases and Develop data models using MongoDB.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	2	3	3	-	-	-	-	-	-	1	3	3	3
CO2	2	3	2	3	3	-	-	-	-	-	-	1	3	3	3
CO3	2	3	2	3	3	-	-	-	-	-	-	1	3	3	3
CO4	2	3	2	3	3	-	-	-	-	-	-	1	3	3	3
CO5	2	3	2	3	3	-	-	-	-	-	-	1	3	3	3

UNIT-I

What is Big Data: Why is Big Data Important? When to consider a Big Data solution, Big Data use cases **The Hadoop Distributed Files system:** The Design of HDFS, HDFS Concepts, HDFS Federation, HDFS High Availability, Basic File system Operations, Hadoop File systems, Anatomy of a File Read, Anatomy of a File Write.

MapReduce: What is Map reduce, Architecture of map reduce.

How MapReduce Works: Anatomy of a MapReduce Job Run, Failures in Map Reduce, MapReduce Types and Formats: MapReduce Types, The Default MapReduce Job, Input Formats, Input Splits and Records, Text Input, Output Formats, Text Output, Developing a MapReduce Application.

UNIT-II

Pig: Installing and Running Pig, an Example, Generating Examples, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators, Pig in Practice.
Hive: Installing Hive, The Hive Shell, An Example, Running Hive, Comparison with Traditional Databases, HiveQL, Tables, Querying Data, User-Defined Functions, Writing a User Defined Functions, Writing a User Defined Aggregate Function.

UNIT-III
Introduction to Spark: What is Apache Spark, History of Spark, The Present and Future of Spark, Running Spark, Spark's Basic Architecture Spark Applications Spark's Language APIs Spark's APIs Starting Spark, The SparkSession DataFrames, Partitions, Transformations, Lazy Evaluation, Actions, Spark UI, An End-to-End Example, DataFrames and SQL. **Spark's Toolset:** Running Production Applications, Datasets: Type-Safe Structured APIs, Structured Streaming, Machine Learning and Advanced Analytics, Lower-Level APIs, SparkR, Spark's Ecosystem and Packages.

UNIT-IV
Spark SQL: What Is SQL?, Big Data and SQL: Apache Hive, Big Data and SQL: Spark SQL, Spark's Relationship to Hive, How to Run Spark SQL Queries, Catalog, Tables, Views, Databases, Select Statements
Datasets: When to Use Datasets, Creating Datasets, Actions, Transformations.
Resilient Distributed Datasets: Introduction to RDDs, Creating RDDs, Manipulating RDDs, Transformations, Actions, Saving Files, Caching, Check pointing, Pipe RDDs to System Commands.

UNIT-V
No SQL Databases: Review of traditional Databases, Need for NoSQL Databases, Columnar Databases, Failover and reliability principles, CAP Theorem, Differences between SQL and NoSQL databases, **Working mechanisms of Mongo DB**: Overview, Advantages, Environment, Data Modelling, Create Database, Drop Database, Create collection, Drop collection, Data types, Insert, Query, Update and Delete operations, Limiting and Sorting records, Indexing, Aggregation.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2015.
2. Bill Chambers, Matei Zaharia, "Spark: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2018

Suggested Reading:

1. Thilinagunarathne, "Hadoop MapReduce v2 Cookbook", 2nd Edition, Packet Publishing, 2015.
2. Chuck Lam, Mark Davis, Ajit Gaddam, "Hadoop in Action", Manning Publications Company, 2016.
3. Alex Holmes," Hadoop in Practice", Manning Publications Company, 2012.
4. Alan Gates, "Programming Pig", O'Reilly Media Inc, 2011.
5. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Media Inc, October 2012.

Web Resources:
1. http://www.planetcassandra.org/what-is-nosql
2. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
3. https://class.coursera.org/datasci-001/lecture
4. http://bigdatauniversity.com

20ITC24 **EMBEDDED SYSTEMS AND IOT**

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce the basic concepts of embedded system and 8051 Microcontroller fundamentals.
2. To provide an overview of Internet of Things, building blocks of IoT and to explore various IoT enabling technologies
3. To facilitate the design methodology for IoT.
4. To introduce about the Raspberry Pi device, its interfaces and Django Framework.
5. To deal with software systems and the utilities for case studies.

Course Outcomes:

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

1. Demonstrate Embedded Systems using 8051 Microcontroller.
2. Interpret the various IoT enabling technologies, Levels.
3. Apply IoT design methodology to build a model using devices like Raspberry Pi3.
4. Develop Domain specific Applications and able to differentiate between M2M and IoT.
5. Infer on Industrial IoT through Real case studies.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	3	-	1	1	1	1	1	3	3	3
CO2	2	1	2	1	2	-	3	-	-	-	2	-	3	-	2
CO3	2	1	2	2	2	3	-	-	-	-	2	-	3	-	3
CO4	2	1	1	1	2	-	3	2	-	-	1	1	3	3	2
CO5	2	1	1	1	1	-	-	2	-	-	-	1	3	-	1

UNIT-I

Embedded Computing: Introduction Embedded System Design Process, Characteristics and Challenges of Embedded Systems. **The 8051 Architecture**: Introduction, 8051 Micro controller Hardware. Data Transfer and Logical Instructions, Arithmetic Operations, Decimal Arithmetic, Jump and Call Instructions Applications: Interfacing with Keyboards, Displays, D/A and A/D Conversions.

UNIT-II

Introduction to Internet of Things: Definitions & Characteristics of IoT, Physical Design of IOT-Things in IoT, IoT Protocols, Logical Design of IOT-IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IOT Enabling Technologies-Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IOT Levels & Deployment Templates.

UNIT-III

IoT Platforms Design Methodology: Introduction, IoT Design Methodology Steps-Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service

Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device and Component Integration, Application Development, Case Study on IoT System for Weather Monitoring.
IoT Physical Devices and End Points: Basic building blocks of an IoT device, Raspberry Pi About the board, Raspberry Pi interfaces-Serial, SPI, I2C. Python Web Application Framework: Django Framework-Roles of Model, Template and View.

UNIT-IV

Domain Specific IOTs: Various types of IoT Applications in Home Automation- smart lighting, Smart appliance, smoke and gas detectors, Cities, Environment, Energy, Retail, Logistics Agriculture, Industry, Health & Life Style-Wearable Electronics. **IoT and M2M** – Introduction, M2M, Differences between IoT and M2M, Software Defined Networking, Network Function Virtualization.

UNIT-V

Industrial IoT: Introduction to Industrial IoT, IIoT Communication**,** Industry 4.0 Globalization and Emerging Issues, The Fourth Revolution, Security and Fog Computing.

Real case studies:

Case study - I: Milk Processing and Packaging Industries

Case study - II: Manufacturing Industries

Text Books:

1. Wayne Wolf, "Computers as Components", 1st Edition, Academic press, 2001.
2. Kenneth J.Ayala, "The 8051 Microcontroller", 3rd Edition, Thomson, 2014.
3. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.
4. Misra, C. Roy, and A. Mukherjee, 2020 "Introduction to Industrial Internet of Things and Industry 4.0". CRC Press.

Suggested Reading:

1. Raj Kamal, "Embedded Systems", 2nd Edition, McGraw Hill, 2015.
2. Samuel Greengard, "The Internet of Things", 1st Edition, MIT Press, 2015.
3. Peter Waher, Pradeeka Seneviratne, Brian Russell, Drew Van Duren, "IoT: Building Arduino-Based Projects", 1st Edition, Packt Publishing Ltd, 2016.
4. Jeeva Jose, "Internet of Things", Khanna Book Publishing Company,

Web Resources:

1. http://ee.sharif.edu/~sakhtar3/books/The%208051%20Microcontroller%20Ayala/The%208051%20Microcontroller%20Architecture,%20Programming%20and%20Applications%201991.pdf
2. https://slideplayer.com/slide/3944480/.
3. https://nptel.ac.in/noc/individual_course.php?id=noc17-cs05.
4. https://slideplayer.com/slide/5740917/.
5. https://onlinecourses.nptel.ac.in/noc20_cs69/preview

20ADC10 **DEEP LEARNING**

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To impart knowledge on the basic concepts of Neural Networks and Deep learning.
2. To familiarize various neural network architectures.
3. To learn usage of neural networks for problem solving.
4. To familiarize various deep learning models.
5. To facilitate usage of deep learning applications in societal context.

Course Outcomes:

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

1. Explain the basic principles of neural networks and deep learning.
2. Implement simple neural network algorithms.
3. Compare modeling aspects of various neural network architecture.
4. Evaluate Convolutional Neural Network models on real data sets.
5. Analyze and optimize Recurrent Neural Network models for various applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	-	-	-	-	-	-	1	1	2	3	2
CO2	2	2	2	2	1	-	-	-	-	-	1	1	2	3	2
CO3	2	2	1	1	1	-	-	-	-	-	1	-	2	-	2
CO4	2	2	2	2	1	-	-	-	-	-	1	1	2	3	2
CO5	-	1	1	1	1	-	-	-	-	-	-	-	2	-	2

UNIT-I

Introduction to Artificial Neural Networks: From Biological to Artificial Neurons, Implementing MLP, Fine-Tuning Neural Network Hyper parameters, Training Deep Neural Networks: The Vanishing/Exploding Gradients Problems, Reusing Pre trained Layers, Faster Optimizers and Avoiding Overfitting through Regularization.

UNIT-II

Linear Neural Networks: Linear Regression, Linear Regression Implementation from Scratch, Concise Implementation of Linear Regression, Softmax Regression, The Image Classification Dataset, Implementation of Softmax Regression from Scratch, Concise Implementation of Softmax Regression.

UNIT-III

Deep Learning Computation: Layers and Blocks, Parameter Management, Deferred Initialization, Custom Layers, File I/O, GPUs Convolutional Neural Networks: From Fully-Connected Layers to Convolutions, Convolutions for Images, Padding and Stride, Multiple Input and Multiple Output Channels, Pooling, Convolutional Neural Networks (LeNet).

UNIT-IV

Modern Convolutional Neural Networks: Deep Convolutional Neural Networks (AlexNet), Networks Using Blocks (VGG), Network in Network (NiN), Networks with Parallel Concatenations (GoogLeNet), Batch Normalization, Residual Networks (ResNet), Densely Connected Networks (DenseNet), Recurrent Neural Networks: Sequence Models, **Recurrent Neural Networks**: Implementation of Recurrent Neural Networks from Scratch, Concise Implementation of Recurrent Neural Networks.

UNIT-V

Modern Recurrent Neural Networks: Gated Recurrent Units (GRU), Long Short-Term Memory (LSTM), Deep Recurrent Neural Networks, Bidirectional Recurrent Neural Networks, Machine Translation and the Dataset, Encoder-Decoder Architecture, Sequence to Sequence Learning.

Optimization Algorithms: Optimization and Deep Learning, Convexity, Gradient Descent, Stochastic Gradient Descent.

Text Books:

1. Aurélien Géron, "Hands-on Machine Learning with Scikit-Learn, Keras & TensorFlow", Orielly, 2nd edition, 2019.
2. Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola, "Dive into Deep Learning", d2l.ai, 2021

Suggested Reading:

1. Levitin A, "Introduction to the Design And Analysis of Algorithms", Pearson Education, 2008.
2. Ian Goodfellow,Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016
3. Indra den Bakker, "Python Deep Learning Cookbook", Packt publisher, 2017
4. Wei Di, Anurag Bhardwaj, Jianing Wei, "Deep Learning Essentials" , Packt publishers, 2018

Web Resources:

1. http://nptel.ac.in/courses

20ITC25 **CLOUD COMPUTING**

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. Learn the fundamentals of cloud computing paradigm.
2. Learn various deployment and development models.
3. Learn various security concerns related to cloud.
4. Learn about various offerings of cloud service providers.

Course Outcomes:

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

1. Understand the basic ideas of Cloud Computing and its services.
2. Analyze the architecture, deployment models and infrastructure models of Cloud Computing.
3. Realize distributed storage and performance for implementing virtualization.
4. Analyze cloud computing security, federation, presence, identity, and privacy.
5. Use IaaS / PaaS service offered by cloud service providers

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	3	3	3	-	-	-	-	-	3	-	-	3	3
CO4	3	3	3	3	-	3	-	-	-	3	-	-	-	3	-
CO5	3	3	3	3	3	-	-	-	3	3	3	-	-	3	3

UNIT-I

Introduction to Cloud Computing: Cloud Computing in a Nutshell, Roots of Cloud Computing, Layers and Types of Cloud, Features of a cloud, Software-as-a-Service, Platform-as-a-Service, Infrastructure-as-a- Service, Challenges and Risks.

Cloud Computing Platforms: Infrastructure as service: Amazon EC2, Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing.

UNIT-II

Service and Deployment Models: The promise of the cloud, the cloud service offerings and Deployment model, Challenges in the cloud.

Broad Approaches to Migrating into Cloud: Why Migrate? Deciding on cloud migration.

The Seven Step Model of Migration into Cloud: Migration Risks and Mitigation.

Managing Cloud Services: Organizational Issues

Administering Cloud Services: Service Level Agreements (SLA) and Monitoring Support, Billing and Accounting, Technical Interface, Managing Cloud Resources, Maintaining Connections.

UNIT-III

Web Services: SOAP/WSDL web services, REST web services, SOAP v/s REST

AJAX: Asynchronous 'rich' interfaces
Mashups: user interface services
Cloud Technologies: Study of Hypervisor
Virtualization Technology: Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization
Multitenant Software: Multi-entity support, multi-schema approach, multi-tenance using cloud data stores, Data access control for enterprise applications.

UNIT-IV
Cloud Security Fundamentals: Vulnerability assessment tool for cloud, Privacy and Security in cloud.
Cloud Computing Security Architecture: Architectural Considerations- General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro-architectures; Identity Management and Access control Identity management, Access control, Autonomic Security.
Cloud Computing Security Challenges: Virtualization security management virtual threats, VM Security Recommendations, VM-Specific Security techniques.

UNIT-V
Enterprise Cloud Computing Ecosystem: Introduction, Public Cloud Providers, Cloud Management Platforms and Tools, Tools for **Building** Private Cloud: IaaS using Eucalyptus, PaaS on IaaS –AppScale.
Roadmap for Enterprise Cloud Computing: Introduction, Quick wins using Public Clouds, Future of Enterprise Cloud Computing: Commoditization of the data center, Inter-operating Virtualized Data Centers, Convergence of private and public clouds, Generalized 'cloud' services.

Text Books:

1. Rajkumar Buyya, "Cloud Computing: Principles and Paradigms", First Edition, John Wiley & Sons.
2. Gautam Shroff, "Enterprise Cloud Computing: Technology, Architecture, Applications", First Edition,.Cambridge University Press.

Suggested Reading:

1. Barrie Sosinsky, "Cloud Computing Bible", First Edition, Wiley India,.
2. Tim Malhar, S.Kumaraswammy, S.Latif, "Cloud Security & Privacy", First Edition, O'Really Publications,.

20ADC15 **BIG DATA ANALYTICS LAB**

Instruction	3 L Hours per week
CIE	50 Marks
SEE	50 Marks
Credits	1.5

Course Objectives:

1. To provide the knowledge to set up a Hadoop Cluster and implement applications using MapReduce.
2. To introduce Pig, Pig Latin and HiveQL to process big data.
3. To get familiarized with the latest big data frameworks and writing applications using Spark and Scala.
4. To learn querying large datasets with SparkSQL.
5. To gain knowledge to work with NoSQL databases.

Course Outcomes:

Upon completing this course, students will be able to:

1. Explain Hadoop working environment and develop applications using MapReduce framework.
2. Develop scripts using Pig to solve real world problems and query the datasets using Hive.
3. Develop applications in Spark environment using RDDs.
4. Query real time data using SparkSQL.
5. Query large datasets using NoSQL.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	2	2	-	-	-	-	-	-	1	3	3	2
CO2	1	2	1	2	2	-	-	-	-	-	-	1	3	3	2
CO3	1	2	1	2	2	-	-	-	-	-	-	1	3	3	2
CO4	1	2	1	2	2	-	-	-	-	-	-	1	3	3	2
CO5	1	2	1	2	2	-	-	-	-	-	-	1	3	3	2

LIST OF PROGRAMS

1. Exploring and using basic HDFS commands.
2. Implement below applications using MapReduce on single node cluster
   (i) Word Count Application
   (ii) Analysis of Weather Dataset
   (iii) User Data Analysis
   (iv) Web Log Analysis
3. Working with Pig Latin Script and HiveQL.
4. Processing of large dataset on Spark framework and working with Spark SQL.
5. Designing and modelling NOSQL databases with MongoDB.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2015.
2. Bill Chambers, Matei Zaharia, "Spark: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2018
3. Tanmay Deshpande, "Hadoop Real-World Solutions Cookbook", 2nd Edition, Packt Publishing, 2016.

Suggested Reading:

1. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Media Inc, October 2012.
2. Vignesh Prajapati, "Big data Analytics with R and Hadoop", Packt Publishing, November 2013.

Web Resources:

1. https://parthgoelblog.wordpress.com/tag/hadoop-installation
2. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
3. https://class.coursera.org/datasci-001/lecture
4. http://bigdatauniversity.com

20ITC26 **EMBEDDED SYSTEMS AND IOT LAB**

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Course Objectives:

1. To familiarize students with Embedded Programming.
2. To Experiment with On-Boarding Raspberry Pi / Arduino.
3. To Programming with Raspberry Pi Pins / Arduino Pins using sensors.
4. To introduce the concept of cloud data in IoT environment.
5. To Understand IoT Applications in real time scenario.

Course Outcomes:

Upon completing this course, students will be able to:

1. Develop Embedded System using 8051 in Embedded 'c'
2. Implement Python scripts that run on Raspberry Pi/Arduino.
3. Build IoT Applications using sensors.
4. Demonstrate Read and write cloud data using Thing speak.
5. Interpret the Case studies in different domains.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	-	2	3	3	-	-	-	-	-	-	3	3	2
CO2	2	1	1	2	3	3	-	-	-	-	-	-	3	3	2
CO3	2	1	-	2	3	3	-	-	-	-	-	-	3	3	2
CO4	2	1	-	2	3	3	2	1	1	1	2	1	3	3	2
CO5	2	1	1	2	3	3	2	1	1	1	1	1	3	-	-

LIST OF PROGRAMS

1. Interface Input-Output and other units such as: Relays, LEDs, Switches, Stepper Motors using 8051 Micro controllers.
2. Study and Configure Raspberry Pi.
3. Write programs using Raspberry Pi to blink LED.
   a)Using loops b)Using conditional & control statements
4. Write program using Raspberry Pi to interface LEDs, Switch and Buzzer.
5. Interface different Sensors using Raspberry Pi.
   a) Temperature & Humidity b) PIR c) GAS d) LDR d) Rain e) Soil moisture.
6. Write a program to monitor temperature and humidity using DHT (Digital Humidity and Temperature) sensor using Raspberry Pi / Arduino.
7. Uploading and reading the Cloud data using Thing speak platform.

Text Books:

1. Kenneth J.Ayala, "The 8051 Microcontroller", 3rd Edition, Thomson, 2014.
2. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.
3. Misra, C. Roy, and A. Mukherjee, 2020 "Introduction to Industrial Internet of Things and Industry 4.0". CRC Press.

Suggested Reading:

1. Raj Kamal, "Embedded Systems", 2nd Edition, McGraw Hill, 2015.
2. Samuel Greengard, "The Internet of Things", 1st Edition, MIT Press, 2015.
3. Peter Waher, Pradeeka Seneviratne, Brian Russell, Drew Van Duren, "IoT: Building Arduino-Based Projects", 1st Edition, Packt Publishing Ltd, 2016.
4. Jeeva Jose, "Internet of Things", Khanna Book Publishing Company

20ITC27 **MINOR PROJECT – II**
(Deep Learning Lab)

Instruction	3 L Hours per week
Duration of SEE	-
SEE	-
CIE	50 Marks
Credits	1.5

Course Objectives:

1. To enable students to practice learning by doing.
2. To develop capability to analyse and solve real world problems.
3. To inculcate critical thinking and active experimentation of students.
4. To impart team building and management skills among students.
5. To instill writing and presentation skills for the project.

Course Outcomes:

Upon completing this course, students will be able to:

1. Define a project proposal by interpreting real time scenarios and the Literature.
2. Plan, analyse, Design and implement a project.
3. Develop solution of the identified problem with the help of modern technologies
4. Work as a team and develop a collaborative learning environment.
5. Prepare and submit the Report and deliver a presentation before the departmental Committee.

Minor Project is aimed to enable the students to develop a product/application based on the course **Deep Learning**, Course code - **20ADC10**. The student has to implement and present the project as per the given schedule. Report of the project work has to be submitted for evaluation.

Schedule

S No	Description	Duration
1.	Data Collection, Pre-processing and Feature Computation of different types of data.	2 weeks
2.	Developing and Tuning various CNN Models	3 weeks
3.	Developing and Tuning various RNN models	2 weeks
4.	Problem Identification & Abstract preparation	1 week
5	Implementation and inferences	3 weeks
6.	Documentation and Project Presentation	2 weeks

Guidelines for the Award of Marks

S No	Description	Max. Marks
Final Assessment		**30**
1.	PPT Preparation	10
2.	Technical Content	10
3.	Question and Answers	5
4.	Report Preparation	5

Note: Final Assessment for Minor Project is to be done for the entire class by a panel of all the faculty handling Minor Project for that class.

20EGCO3 **EMPLOYABILITY SKILLS**

(BE/BTech V & VI semester - Common to all Branches)

Instruction	2 L Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. Learn the art of communication, participate in group discussions and case studies with confidence and to make effective presentations.
2. With- resume packaging, preparing them to face interviews.
3. Build an impressive personality through effective time management, leadership qualities, self-confidence and assertiveness.
4. Understand professional etiquette and to make them learn academic ethics and value system.
5. To be competent in verbal aptitude.

Course Outcomes:

Upon successful completion the students will be able to:

1. Become effective communicators, participate in group discussions with confidence and be able to make presentations in a professional context.
2. Write resumes, prepare and face interviews confidently.
3. Be assertive and set short term and long term goals, learn to manage time effectively and deal with stress.
4. Mak**e** the transition smoothly from campus to work, use media with etiquette and understand the academic ethics.
5. Enrich their vocabulary, frame accurate sentences and comprehend passages confidently.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	-	2	2	2	-	-	-
CO 2	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	-	2	-	-	-	-	-	2		-	2	-	-	-
CO 5	-	-	-	-	-	2	-	-	-	-	-	-	-	-

UNIT-I

Verbal Aptitude: Error Detection, Articles, Prepositions, Tenses, Concord and Transformation of Sentences- Jumbled Words/Sentences- Vocabulary, Synonyms, Antonyms, One Word Substitutes, Idioms and Phrases, Word/Sentence/Text Completion- Reading Comprehension.

UNIT-II

Group Discussion & Presentation Skills: Dynamics of Group Discussion-Case Studies- Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Accuracy, Coherence. Elements of Effective Presentation – Structure of a Presentation – Presentation tools – Body language - Preparing an Effective PPT

UNIT-III

Behavioural Skills: Personal strength analysis-Effective Time Management- Goal Setting- Stress management-

Corporate Culture – Grooming and etiquette-Statement of Purpose (SOP).

UNIT-IV

Mini Project: Research-Hypothesis-Developing a Questionnaire-Data Collection-Analysis-General and Technical Report - Writing an Abstract –Technical Report Writing-Plagiarism-Project Seminar.

UNIT-V

Interview Skills: Cover Letter andRésumé writing – Structure and Presentation, Planning, Defining the Career Objective, Projecting ones Strengths and Skill-sets – Interviews: Concept and Process, Pre-Interview Planning, Opening Strategies, Answering Strategies, Mock Interviews.

Suggested Reading:

1. Leena Sen, "Communication Skills", Prentice-Hall of India, 2005
2. Dr. Shalini Verma, "Body Language - Your Success Mantra", S Chand, 2006
3. Edgar Thorpe and ShowickThorpe , "Objective English", 2nd edition, Pearson Education, 2007
4. Ramesh, Gopalswamy, and Mahadevan Ramesh, "The ACE of Soft Skills", New Delhi: Pearson, 2010
5. Gulati and Sarvesh, " Corporate Soft Skills", New Delhi: Rupa and Co. , 2006
6. Van Emden, Joan, and Lucinda Becker, "Presentation Skills for Students", New York: Palgrave Macmillan, 2004
7. A Modern Approach to Verbal & Non-Verbal Reasoning by R S Aggarwal, 2018
8. Covey and Stephen R, "The Habits of Highly Effective People", New York: Free Press, 1989

20ADE03 **NATURAL LANGUAGE PROCESSING**

(Professional Elective –3)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To understand the steps involved in Natural language processing
2. To learn about the lexical, syntactic and semantic analysis of natural language processing
3. To explore the various parsing techniques for natural languages
4. To understand the statistical models for Natural language processing
5. To learn about the various applications involved in Natural language processing

Course Outcomes:

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

1. Justify the various steps necessary for processing natural language
2. Suggest appropriate semantic modeling and sequence labeling techniques for a particular application.
3. Apply appropriate neural network based models for a contextual application
4. Analyse existing encoder-decoder models and information extraction techniques.
5. Identify the significance of word net and analyze the applications of Natural Language Processing such as Question Answering and chatbots.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	3	1	1	-	-	-	1	1	1	1	3	-	3
CO2	2	1	2	1	2	-	-	-	-	-	1	-	2	-	3
CO3	2	1	2	2	1	-	-	-	-	-	-	-	3	-	3
CO4	2	1	1	1	1	-	-	-	-	-	-	1	1	-	3
CO5	2	1	1	1	1	-	-	-	-	-	-	1	1	-	3

UNIT-I

Introduction: Regular Expressions**,** Text Normalization, Edit Distance**, N-gram Language Models**: N-Grams, Evaluating Language Models, Sampling sentences from a language model, Generalization and Zeros, Smoothing, Kneser-Ney Smoothing

UNIT-II

Vector Semantics and Embeddings: Lexical Semantics, Vector Semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF: Weighing terms in the vector, Pointwise Mutual Information (PMI), Applications of the tf-idf or PPMI vector models, Word2vec, Visualizing Embeddings, Semantic properties of embeddings, Bias and Embeddings, Evaluating Vector Models.

Sequence Labeling for Parts of Speech and Named Entities: English Word Classes, Part-of-Speech Tagging, Named Entities and Named Entity Tagging, HMM Part-of-Speech Tagging, Conditional Random Fields (CRFs), Evaluation of Named Entity Recognition

UNIT-III

Deep Learning Architectures for Sequence Processing: Language Models Revisited, Recurrent Neural Networks, RNNs as Language Models, RNNs for other NLP tasks, Stacked and Bidirectional RNN architectures, The LSTM, Self-Attention Networks: Transformers, Transformers as Language Models, Contextual Generation and Summarization. Case study in NLP.

Machine Translation and Encoder-Decoder Models: Language Divergences and Typology, The Encoder-Decoder Model, Encoder-Decoder with RNNs, Attention, Beam Search, Encoder-Decoder with Transformers, Some practical details on building MT systems, MT Evaluation, Bias and Ethical Issues

UNIT-IV

Constituency Grammars-Constituency, Context-Free Grammars, Some Grammar Rules for English. Some Grammar Rules for English, Grammar Equivalence and Normal, Lexicalized Grammars. **Constituency Parsing-**Ambiguity**,** CKY Parsing: A Dynamic Programming Approach, Span-Based Neural Constituency Parsing, Evaluating Parsers, Partial Parsing, CCG Parsing. **Dependency Parsing**-Dependency Relations, Dependency Formalisms, Dependency Treebanks, Transition-Based Dependency Parsing, Graph-Based Dependency Parsing, Evaluation

UNIT-V

Word Senses and WordNet: Word Senses, Relations Between Senses, WordNet: A Database of Lexical Relations, Word Sense Disambiguation, Alternate WSD algorithms and Tasks, Using Thesauruses to Improve Embeddings, Word Sense Induction. **Question Answering:** Information Retrieval, IR-based Factoid Question Answering, Entity Linking, Knowledge-based Question Answering, Using Language Models to do QA, Classic QA Models, Evaluation of Factoid Answers. **Introduction to Chatbots-Chatbots, GUS:** Simple Frame-based Dialogue Systems, The Dialogue-State Architecture, Evaluating Dialogue Systems, Dialogue System Design

Text Books:

1. Jurafsky Daniel, Martin James, "Speech and Language Processing", 3rd Edition, Pearson Education, 2021.
2. Christopher Manning, Schutze Heinrich, "Foundations of Statistical Natural Language Processing", MIT Press, 1999.

Suggested Reading:

1. Allen James, "Natural Language Understanding", 2nd Edition, Benjamin Cumming, 1995.
2. Charniack Eugene, "Statistical Language Learning", MIT Press, 1993.

Web Resources:

1. http:// archive.nptel.ac.in/courses/106/105/106105158/
2. http:// archive.nptel.ac.in/courses/106/106/106106211

20ITE10 **DATA COMPRESSION**
(Professional Elective –3)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To introduce the basic applications, concepts, and techniques of Data Compression
2. To familiarize the concepts of Huffman Coding and arithmetic coding
3. To introduce the dictionary approach in compression
4. To learn different concepts of compression techniques
5. To Study different types of quantization techniques

Course Outcomes:

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

1. Understand the Mathematical Preliminaries involved in compression techniques.
2. Analyze Hoffman and Arithmetic coding for Lossless image compression, Text compression, and Audio Compression
3. Apply LZ77, LZ78 dictionary-based compression techniques.
4. Identify appropriate Lossless and Lossy algorithms for compression of given digital information.
5. Evaluate scalar and vector quantization techniques

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	-	2	-	-	-	-	-	-	-	1	-	-	2
CO2	2	2	1	1	1	-	-	-	-	-	-	2	2	3	3
CO3	3	2	1	2	2	-	-	-	-	-	1	2	2	3	2
CO4	3	3	1	2	2	-	-	-	-	-	1	2	2	3	2
CO5	3	2	1	2	2	-	-	-	-	-	1	2	2	3	2

UNIT-I

Introduction: Compression Techniques, Modeling and Coding **Mathematical Preliminaries for Lossless Compression:** Models- Physical Models, Probability Models, Markov Models Coding- Uniquely Decodable Codes, Prefix codes.

Huffman coding: The Huffman Coding Algorithm- Minimum variance Huffman codes, Adaptive Huffman coding- Update Procedure, Encoding Procedure, Decoding Procedure, Golomb Codes, Rice codes, Tunstall Codes, Applications of Huffman Coding- Lossless Image compression, Text compression, Audio Compression.

UNIT-II

Arithmetic coding: Coding a sequence- Generating a Tag, Deciphering the Tag, Generating Binary Code- Uniqueness and Efficiency of the Arithmetic code, Algorithm implementation, Integer Implementation, Comparison of Huffman and Arithmetic coding, Applications.

UNIT-III

Dictionary Techniques: Static Dictionary- Diagram Coding, Adaptive Dictionary- The LZ77 approach, The LZ78 Approach, Applications- File and Image Compression.

UNIT-IV

Context based Compression: Prediction with partial match(ppm)- The Basic Algorithm, The Escape symbol, Length of context, The Exclusion Principle.

Lossless Image Compression: The Old JPEG Standard, CALIC, JPEG-LS.

UNIT-V

Scalar Quantization: The Quantization Problem, Uniform Quantizer, Adaptive Quantization- Forward Adaptive, Backward Adaptive, Nonuniform Quantization- pdf optimized Quantization, Companded Quantization.

Vector Quantization: Advantages of Vector Quantization over Scalar Quantization, Tree structured Vector Quantization, Structured Vector Quantization.

Text books:

1. Khalid Sayood, "Introduction to Data Compression", 5th Edition, Morgan Kaufmann Publishers, 2017.
2. Mark Nelson, Jean Loup Gaily, "The Data Compression book", 2nd Edition, M&T Books, 1996.

Suggested Reading:

1. David Salomon, D. Bryant, Giovanni Motta, "Handbook of Data Compression, 5th Edition, Springer Publishers, 2010.
2. James A. Storer, "Data Compression Methods and Theory", Computer Science Press, 1987
3. Colt McAnlis and Aleks Haecky, "Understanding Compression", 1st Edition, O'reilly, 2016
4. Ida Mengyi Pu, "Fundamental Data Compression", 1st Edition, Elsevier Science Publishers, 2006

Web Resources:

1. http://www.data-compression.info/index.html
2. https://www.cs.cmu.edu/~guyb/realworld/compression.pdf

20ADE06 MICROSERVICES WITH SPRING BOOT

(Professional Elective –3)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To Understand the basic concepts of the Spring Framework
2. To provide basic knowledge of Web Application Development with Spring Boot and Restful APIs
3. To explore data access with Spring's DAO Module
4. To acquire Knowledge of Spring transaction management
5. To study Spring's unit testing framework and Introduce Spring Security with Rest API

Course Outcomes:

Upon completing this course, students will be able to:

1. Acquire the basic concepts of the Spring Framework
2. Interact with databases using Spring's support for JDBC and JPA.
3. Build spring boot applications using Dependency Injection concept
4. Apply Transaction Management concepts of spring in Enterprise Application Development and develop the Spring-MVC based Applications to solve the real-world problems.
5. Use Spring Unit testing framework and configure security on Spring MVC Applications

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	1	1	-	-	-	1	1	1	1	3	3	3
CO2	2	1	2	1	2	-	-	-	-	-	1	-	2	3	3
CO3	2	1	2	2	1	-	-	-	-	-	-	-	3	3	3
CO4	2	1	1	1	1	-	-	-	-	-	-	1	1	3	3
CO5	2	1	1	1	1	-	-	-	-	-	-	1	1	3	3

UNIT-I

Spring Overview: Introduction to Spring Framework, The DI Container, Evolution of Spring Framework.

Java Configuration: Java configuration and the Spring application context, @Configuration and @Bean annotations, @Import: working with multiple configuration files, defining bean scopes, launching a Spring Application and obtaining Beans, External properties & Property sources, Environment abstraction, Using bean profiles, Spring Expression Language (SpEL).

Annotation and Component Scanning: Component scanning, Autowiring using @Autowired, Java configuration versus annotations mixing Lifecycle annotations: @PostConstruct and @PreDestroy, Stereotypes and meta-annotations.

UNIT-II

Web Applications with Spring Boot: Introduction to Spring MVC and request processing, Controller method signatures, Using @Controller, @RestController and @GetMapping annotations and Configuring Spring MVC with Spring Boot.

RESful Application with Spring Boot: An introduction to the REST architectural style, Controlling HTTP response codes with @ResponseStatus, Implementing REST with Spring MVC, @RequestMapping, @RequestBody and @ResponseBody, Spring MVC's HttpMessageConverters and automatic content negotiation and Jakson library.

UNIT-III

Spring Boot Feature Introduction:

Introduction to Spring Boot Features, Value Proposition of Spring Boot and Creating a simple Boot application using Spring Initializer website.

Spring Boot – Dependency Management:

Dependency management using Spring Boot starters, how auto-configuration works, Configuration properties, overriding auto-configuration and Using CommandLineRunner.

UNIT-IV

JDBC Simplification with JdbcTemplate: How Spring integrates with existing data access technologies, Spring's JdbcTemplate and DataAccessException hierarchy.

Spring Boot – Spring Data JPA: Quick introduction to ORM with JPA, Benefits of using Spring with JPA, JPA configuration in Spring, Configuring Spring JPA using Spring Boot, Spring Data JPA dynamic repositories.

Transaction Management with Spring: Transaction overview, Transaction management with Spring, Transaction propagation and rollback rules and Transactions and integration testing.

UNIT-V

Testing a Spring-based Application: Spring and Test-Driven Development, Spring 5 integration testing with JUnit 5, Application context caching and the @DirtiesContext annotation, Profile selection with @ActiveProfiles, Easy test data setup with @Sql.

Securing REST Application with Spring Security: What problems does Spring Security solve? , Configuring authentication, implementing authorization by intercepting URLs, Authorization at the Java method level, Understanding the Spring Security filter chain and Spring security testing.

Actuators, Metrics and Health Indicators: Exposing Spring Boot Actuator endpoints, Custom Metrics, Health Indicators, Creating custom Health Indicators and External monitoring systems.

Text Books:

1. Mark Heckler, "Spring Boot Up and Running, 1st Edition", Oreilly, 2021.
2. Iuliana Cosmina, Rob Harrop, Chris Schaefer, Clarence Ho, " Pro String 5", 5th Edition, Apress, 2019

Suggested Reading:

1. Raja CSP Raman, Ludovic Dewailly, "Building A RESTful Web Service with Spring 5", Packt Publishing, 2018.

Web Resources:

1. https://spring.io/guides/gs/spring-boot/
2. https://docs.spring.io/spring-framework/docs/current/reference/html/index.html

20ITE11 ETHICAL HACKING

(Professional Elective –3)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To present Information security threats & countermeasures
2. To perform security auditing & testing
3. To impart knowledge on issues relating to ethical hacking
4. To present network defense measures
5. To familiarize penetration and security testing issues

Course Outcomes:

Upon successful completion of this course, a student will be able to:

1. Identify the vulnerabilities/threats/attacks.
2. Describe penetration & security testing.
3. Interpret safe penetration techniques on the World Wide Web.
4. Design a computer against a variety of security attacks using various tools.
5. Become a professional ethical hacker.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	-	3	-	3	-	-	2	-	3	3	1
CO2	2	3	1	2	3	3	-	3	-	-	-	-	3	3	1
CO3	2	2	1	-	-	3	-	3	-	-	-	-	3	3	1
CO4	2	3	1	2	3	3	-	3	-	-	-	-	3	3	1
CO5	2	1	1	2	-	3	-	3	-	-	2	-	3	3	1

UNIT–I

Ethical Hacking Overview & Vulnerabilities: Understanding the importance of security, Concept of ethical hacking and essential Terminologies- Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking.

UNIT–II

Footprinting & Port Scanning: Footprinting - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS.

UNIT–III

System Hacking: Aspect of remote password guessing, Role of eavesdropping ,Various methods of password cracking, Keystroke Loggers, Understanding Sniffers ,Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing.

UNIT–IV

Hacking Web Services & Session Hijacking: Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers Understanding Session Hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session Hijacking Tools.

UNIT–V

Hacking Wireless Networks: Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.

Text Book:

1. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010

Suggested Reading:

1. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010
2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", Syngress Media, Second Revised Edition, 2013
3. Rajat Khare, "Network Security and Ethical Hacking", Luniver Press, 2006
4. Ramachandran V, "BackTrack 5 Wireless Penetration Testing Beginner's Guide", 3rd Edition, Packt Publishing, 2011
5. Thomas Mathew, "Ethical Hacking", OSB publishers, 2003

Web Resources:

1. https://www.elsevier.com/books/cyber-security-awareness-forlawyers
2. https://www.coursera.org/specializations/ethical-hacking
3. https://nptel.ac.in/courses

20ITE12 **AGILE METHODOLOGIES**
(Professional Elective –3)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
2. To provide a good understanding of software design and a set of software technologies and APIs.
3. To do a detailed examination and demonstration of Agile development and testing techniques.
4. To understand the benefits and pitfalls of working in an Agile team.
5. To understand Agile development and testing.

Course Outcomes:

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

1. Compare Agile model with traditional models and explain the principles of agile model.
2. Perform iterative agile software processes.
3. Analyze the impact of agile knowledge management in the software development process.
4. Realize the importance of interacting with business stakeholders in determining the requirements for agile software system.
5. Develop techniques and tools for improving team collaboration and agile software quality.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	-	-	1	-	-	1	2	-	-
CO2	2	1	1	-	1	-	-	-	-	-	-	1	1	-	-
CO3	2	2	1	-	-	-	-	-	-	-	2	2	2	-	2
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-	3
CO5	2	1	-	-	-	-	-	-	1	-	-	2	2	-	3

UNIT-I

Agile Methodology: Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values.

UNIT–II

Agile Processes: Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT–III

Agility And Knowledge Management: Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge –

Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story Card Maturity Model(SMM).

UNIT–IV

Agility And Requirements Engineering: Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT-V

Agility And Quality Assurance: Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

Text Books:

1. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Prentice Hall, 2003.
2. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.

Suggested Reading:

1. Craig Larman, "Agile and Iterative Development: A Managerial Guide", Addison-Wesley, 2004.
2. 2. Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth-Heinemann, 2007.

Web Resource:

1. https://www.coursera.org/specializations/agile-development

20EGM03 UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY
(**B.E/B.Tech II/III Year** -Common to all branches)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Introduction

This course discusses the role of human values in one's family, in society and in nature. In the Induction Program, students would get an initial exposure to human values through Universal Human Values–I. This exposure is to be augmented by this compulsory full semester foundation course.

Course Objectives:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in human being, family, society and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes:

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

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. They would have better critical ability.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	2	2	2	-	-	-	-
CO 2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	-	2	-	-	-	-	-	2	-	-	2	-	-	-	-
CO 5	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-

UNIT-I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal HumanValues-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration

- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current Scenario
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-II

Understanding Harmony in the Human Being - Harmony in Myself

- Understanding human being as a co-existence of the sentient 'I' and the material'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

UNIT-III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values ofrelationship
- Understanding the meaning of Trust; Difference between intention andcompetence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co -existence as comprehensive HumanGoals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

UNIT-IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in theNature
- Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self- regulation innature
- Understanding Existence as Co-existence of mutually interacting units in all - pervasivespace
- Holistic perception of harmony at all levels ofexistence.

UNIT-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order:
  a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
  b. At the level of society: as mutually enriching institutions and organizations

Assessment:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self- assessment, peer assessment etc. will be used in evaluation. Example:

Assessment by faculty mentor: 10 marks Self-
assessment/Assessment by peers: 10 M
Socially relevant project/Group Activities/Assignments: 20 marks
Semester End Examination: 60 marks
The overall pass percentage is 40%. In case the student fails, he/she must repeat the course.

Text Books:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1 The teacher's manual
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN978-93-87034-53-2

Suggested Readings:

1. A Nagaraj Jeevan Vidya: EkParichaya, Jeevan Vidya Prakashan, Amar kantak,1999.
2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi,2004.
3. Cecile Andrews, Slow isBeautiful
4. Gandhi - Romain Rolland (English)
5. Dharampal, "Rediscovering India"
6. E. FSchumacher. "Small isBeautiful"
7. J. C. Kumarappa "Economy ofPermanence"
8. Pandit Sunderlal "Bharat Mein AngrejiRaj"
9. Mohandas Karamchand Gandhi "The Story of My Experiments withTruth"
10. 10.Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. Maulana Abdul Kalam Azad, India Wins Freedom-
12. Vivekananda - Romain Rolland(English)
13. The Story of Stuff(Book)