COURSE STRUCTURE & DETAILED SYLLABUS

(R23Regulation)

For

Bachelor of Technology

IV B. Tech

(Applicable for Batches Admitted from 2023-2025)

Department of

COMPUTER SCIENCE & INFORMATION TECHNOLOGY

(Applicable for Batches Admitted from 2023-2025)

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

Lendi Institute of Engineering and Technology

(Approved by A.I.C.T.E & Permanent Affiliated to JNTU-GV, Vizianagaram)

Accredited by NAAC with "A" Grade

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FRAMING OF SYLLABUS

To carry out the syllabus revision for R23, guidelines provided by AICTE, APSCHE, and JNTU-GV have been considered. Subsequently, the faculty of the Department of Computer Science& Information Technology prepared the course structure, taking into account these suggestions from stakeholders, including eminent executives from industries and professors from IITs and NITs.

Accordingly, for the core courses, professional elective contents have been included to meet the requirements of GATE, competitive examinations, and advanced technologies. In the open electives and skill-oriented courses, advanced technologies related to industrial applications have been considered

B.Tech. – IV Year I Semester

S.No.	Category	Title	L	T	P	Credits
1	Professional Core	Software Testing Methodologies	3	0	0	3
2	Management Course-II	Managerial Skills for Engineers	2	0	0	2
3	Professional Elective- IV	Web Services Soft Computing Software Architecture & Design Patterns	3	0	0	3
4	Professional Elective – V	Computer Vision Human Computer Interaction Natural Language Processing	3	0	0	3
5	Open Elective- III	--	3	0	0	3
6	Open Elective-IV	--	3	0	0	3
7	Skill Enhancement Course	React JS	1	0	2	2
8	Audit Course	Entrepreneurship & Incubation (E&I)	2	0	0	--
9	Internship	Evaluation of Industry Internship	--	--	--	2
Total			20	0	2	21

B.Tech.– IV Year II Semester

SNo.	Category	Title	L	T	P	Credits
1	PR	Internship & Project	0	0	24	12
	(i) PR	Internship (100M)	-	-	8	4
	(ii) PR	Project (200M)	-	-	16	8

Year : IV Semester : I

Subject Code	Subject Name	L	T	P	C
	SOFTWARE TESTING METHODOLOGIES	**3**	**0**	**0**	**3**

Course Objectives:

- To Understand the purpose of Testing.
- To Study about Logic Based Testing.
- To Learn how to Test a Project, Starting from Planning, Design Test Cases with Data, perform Testing operations, manage defects and generate test reports.
- To Understand the Software Testing automation process.
- To gain the techniques of using testing tools

Course Outcomes:

- Understand the concepts of Software Testing.
- Design the test cases to check the functionality of software.
- Design the test cases to structural aspects of software.
- Understand various software testing problems and be able to design the solutions.
- Apply knowledge to design the test cases effectively and using the modern tools.

Unit I:

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, Definition, Model for testing, Effective Vs Exhaustive Software Testing. Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, relating test life cycle to development life cycle Software Testing Methodology

Verification and Validation: Verification & Validation Activities, Verification of Requirements, High level and low level designs, How to verify code, Validation

Learning Outcomes:

Understand the purpose of Testing

Apply software testing knowledge and engineering methods.

Verify and validate the test process

Unit II:

Static Testing: inspections, Structured Walkthroughs, Technical reviews

Dynamic Testing I: Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing

Learning Outcomes:

Perform the static testing

Design test cases using black box testing techniques

Unit III:

Dynamic Testing II: White-Box Testing: need, Logic coverage criteria, Basis path testing, Loop testing, data flow testing, mutation testing

Graph matrices and Applications: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm

Learning Outcomes:

Design test cases using white box testing techniques

Design test cases with 100% coverage.

Unit IV:

Validation activities: Unit testing, Integration Testing,. Function testing, system testing, acceptance testing.

Regression Testing: Objectives, Types, Techniques.

Learning Outcomes:

Design the test cases for regression testing.

Perform system testing

Unit V:

Efficient Test Suite Management: Test case design Why does a test suite grow, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing.

Learning Outcomes:

Design the test suite effectively

Automate the testing process

Text Books:

Software Testing, Principles and Practices, Naresh Chauhan, Oxford

Software testing techniques - Baris Beizer, International Thomson computer press, second edition.

Foundations of Software testing, Aditya P Mathur, 2ed, Pearson

Reference books:

Software Testing- Yogesh Singh, CAMBRIDGE

Software Testing, Principles, techniques and Tools, M G Limaye, TMH

Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

COURSE OUTCOMES VS POs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

SNO	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CXXX.1	3	2		2					2	2		3	3		3
CXXX.2	3	3	3	3	3				3	3	2	3	3	3	3
CXXX.3	3	3	3	3	3				3	3	2	3	3	3	3
CXXX.4	3	3	3	3	3				3	3		3	3	3	3
CXXX.5	3	3	3	3	3				3	3	2	3	3	3	3
CXXX.*	3	3	3	3	3				3	3	2	3	3	3	3

Year : IV Semester : I

Subject Code	Subject Name	L	T	P	C
	MANAGERIAL SKILLS FOR ENGINEERS	3	0	0	2

COURSE OBJECTIVES:

- Provide fundamental knowledge on Management, Administration, Organizational methodologies (L3)
- Equip with the knowledge of long term business value for the organization (L2)
- Explain basics of human resource management & marketing required for organization(L3)
- Analyses the PERT/CPM techniques for better Project Management.(L4)
- Incorporate technology perspectives with Managerial practices(L2)

COURSE OUTCOMES:

- Apply principles of management & designs of organization in practical world.(L3)
- Realize concepts of business value development for organizational growth.(L2)
- Provided awareness of human resource management and marketing concepts.(L3)
- Develop PERT/CPM Charts for projects of enterprise and estimate time & cost of project.(L3)
- Analysis of improved decision making with the implementation of technology in Management(L2)

Unit I:

INTRODUCTION TO MANAGEMENT: Management-Concept -Nature-Functions- Evolution of Management Thought -Principles of Management-Theories of Motivation- Managerial skills-Data driven Decision making-Leadership styles - Interpersonal skills- organizational structures.

Learning Outcomes:

- At the end of this unit students will be able to:
- Acquire the techniques, skills and modern engineering tools necessary for engineering practice.(L3)
- Apply concepts & principles of management & structures of organization in a practical world(L3)

Applications:

Divide the class into two teams' old employees and new joiners and motivate the work environment with respect to excellent management and the supportive.

UNIT II:

BUSINESS VALUE DEVELOPMENT: Business Environment-Building business value through Modernization-Business Analytics- Types-Principles of Value Engineering- Approaches and methods of Business value- Strategies for enhancing Business Value -Corporate Social Responsibility-SWOT analysis of Business

Learning Outcomes:

- At the end of this unit students will be able to:
- Measure the value of overall business in the society (L2)
- Analyse the business organization through SWOT analysis (L2)

Application: Analyse a Multi National company's potentialities and business value.

UNIT III:

HUMAN RESOURCES MANAGEMENT & MARKETING MANAGEMENT:

Human Resource Management- Definition and Meaning –Managerial and Operative functions-Job Evaluation and Merit rating- Negotiation skill- Employee performance appraisal.

Marketing Management: Concept- Meaning - Nature-Functions of Marketing- Marketing Mix- Marketing Strategies based on Product Life Cycle-Digital Marketing

Learning Outcomes:

- At the end of this unit students will be able to:
- Comprehend the importance of human resources power in the main functional areas (L2)
- Awareness about marketing mix and strategies(L1)

Application: Apply Human resource and marketing aspects in professional decisions through case studies

UNIT IV :

PROJECT MANAGEMENT: Project Selection and criteria of choice-Project planning and control- Development of Network- Difference between Program Evaluation Review Technique and Critical Path Method- Identifying critical path-crashing (simple problems).

Learning Outcomes:

- At the end of this unit students will be able to:
- Analyze the importance and difficulties associated with the project selection models.(L3)
- Develop PERT/CPM networks for projects of an enterprise and estimate time & cost of project(L3)

Application: Analyze various parameters of the project like critical path, crashing etc. for best cost decisions according to operations of the project.

UNIT V:

Technology in Management: AI(Artificial Intelligence) in Management-Finance, Operations,Human Resource-Development Phases of AI for Management Support-Benefits, Challenges and considerations-Best Practices for AI Implementation-Case Examples

Learning Outcomes:

- Enhanced decision making skill and efficiency in operations(L2)
- Strategical usage of emerging technologies(L2)

Application:Integrate AI with existing management systems (ERP, CRM).

TEXT BOOKS:

- Management Science by Aryasri; Publisher: Tata McGraw Hill, 2009
- L.M. Prasad, Principles and Practice of Management.
- Reference Books:
- Robins, Stephen P., *Fundamentals of Management,* Pearson, India.
- Kotler Philip & Keller Kevin Lane: Marketing Management 12/e, PHI, 2007
- Koontz &Weihrich: *Essentials of Management*, 6/e, TMH, 2007
- Valuing a Business, 5th Edition : The Analysis and Appraisal of Closely Held Companies, Shannon P.Pratt
- Artificial Intelligence Concepts for Management, Paperback, Katzan Harry Jr, 2023

Web links:

www.managementstudyguide.com

www.citehr.com

www.nptel.ac.in/courses/122106032 4.https://nptel.ac.in/courses/110/106/110106145/

5. www.btechguru.com/courses--nptel--basic-course

Year : IV Semester : I

Subject Code	Subject Name	L	T	P	C
	Web Services	3	0	0	3

Course Objectives:

- Understand web services and Service oriented architecture (SOA).
- Implement java generic classes and annotations.
- Implement java persistence using JSON and XML Parsers.
- Implement XML Web services using WSDL and JAX-WS.
- Implement RESTFul Web Services using JAX-RS.

Course Outcomes:

- Understand the importance of Web Services and Service Oriented Architecture.
- Implement Java Generic data Structures and Annotations.
- Implement object persistence using different APIs.
- Apply XML Web Services using JAX-WS APIs.
- Apply RESTFul Web Services using JAX-RS APIs.

UNIT 1

Introduction to Web Services - Client Server Distributed Computing, Web Services, Features and characteristics of web services, Web service architecture, WS Components, Soap Web Services, Rest Web services, Soap vs Rest, Service Oriented Architecture, Micro services, Web Services vs Micro Services.

Learning Outcomes: student will be able to

- Understand Web Service Architecture. (L2)
- Understand Soap and Rest Web services. (L2)
- Understand Web Services architecture and its role in services. (L2)

UNIT 2

Generics & Annotations: Generics in Java, Advantages of generics, Generic Classes, Type Parameters, Wild Cards, Nested Collections, Annotations, Annotation Elements, Built-in Annotations, Custom Annotations.

Learning Outcomes: student will be able to

- Understand java generics and annotations (L2).
- Implement Wild cards for generic types and classes (L4).
- Implement Custom annotations and for complex java classes. (L4).

UNIT 3

Object Persistence: XML, Rules of XML Document, XML Schema and Name Space, Marshalling and Un

Marshalling XML document using JAXB, DOM Parser, JSON Object, JSON Array, Serializing and De-serializing JSON, JSON Parsing using Jackson APIs.

Learning Outcomes: Student will be able to

- Understand structure of XML document(L2).
- Implement XML parsers using JAXB APIs and DOM (L4).
- Implement JSON binding using JACKSON APIs (L4).

UNIT 4

SOAP Web Services: Introduction to SOAP, SOAP Architecture, WSDL, Structure of WSDL, WSDL Document Elements: Definitions, Types, Message, Operation, portType, binding, port & services, Schema Types and Binding styles, Publishing SOAP Web Services, Consuming Web Services, Exploring javax.xml.ws.*.

Learning Outcomes: Student will be able to

- Understand the structure of SOAP and WSDL. (L2)
- Implement WSDL using JAX-WS APIs. (L4)

UNIT 5*:*

RESTFul Web Services: Introduction to RESTFul Web Services, HTTP Request & Response Header, HTTP Methods, Publishing and Consuming Rest based XML Web Services, Publishing and Consuming REST based JSON web services, Exploring JAX-RS through Jersey APIs: javax.ws.rs.*.

Learning Outcomes: Student will be able to

- Understand RESTFul Web Services and its structure. (L2)
- Analyze end point Web Services using JAX-RS. (L4)

Applications:

- Amazon Web Services
- Currency Converter Applications
- Movie Rating Web Services
- Client Server Applications.
- Online Transportation Applications like Uber, OLA etc.
- Project Deployment Models

Text Books:

- Java, How to Program, 9th Edition, Dieitel & Deitel, 2012.
- Java Web Services: Up and Running, 2nd Edition by Martin Kalin, 2013, Orielly Media.
- Java XML and JSON, 2nd Edition, Jeff Friesen, Apress.

Reference Books:

XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education.

Building web Services with Java, 2nd Edition, S. Graham and others, Pearson Education.

Java Web Services, D.A. Chappell & T. Jewell, O'Reilly, SPD.

COURSE OUTCOMES VS POs MAPPING (DETAILED: HIGH: 3, MEDIUM: 2, LOW: 1)

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

Year : IV Semester : I

Subject Code	Subject Name	L	T	P	C
	Soft Computing	3	0	0	3

Course Objectives:

- To make the students to be familiar with the concept of classification techniques to solve real problems.
- To Familiarize with Soft computing concepts.
- To have a detailed study of neural networks, Fuzzy Logic and uses of Heuristics based on human experience.
- To introduce the concepts of genetic algorithm and its applications to soft computing using some applications.
- To make the students to have general overview on selection and decision making strategies.

Course Outcomes:

- Understand basics of soft computing .
- Analyze the Learning Process of Soft Computing.
- Understand various Fuzzy sets.
- Analyze the concepts of Genetic algorithm and its applications..
- Analyze decision tree algorithms

UNIT I

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing,Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing,Applications of Soft Computing Techniques.

Learning Outcomes: Student will be able to

Familiarize with soft computing concepts.(L1)

Understand the Applications of Soft Computing Techniques.(L2)

UNIT II

Learning Process: Error Correction learning, Memory based learning, Hebbian learning, Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process.

Learning Outcomes: Student will be able to

Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.(L2)

Recognize the feasibility of applying a soft computing methodology for a particular problem.(L3)

Unit III

Classical & Fuzzy Sets: Introduction to classical sets – properties, operations and relations; Fuzzy sets – memberships, uncertainty, operations, properties, fuzzy relations, cardinalities, membership functions.

Learning Outcomes: Student will be able to

List the facts and outline the different process carried out in fuzzy logic, ANN and Genetic Algorithms.(L2)

Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic(L2)

Unit IV

Genetic Algorithms: Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm.

Learning Outcomes: Student will be able to

Learn the concepts of Genetic algorithm and its applications.(L1)

Discuss the ideas of Basic Concepts, Basic Operators and Crossover and Mutation Properties.(L2)

Unit V

Decision Tree Learning: Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning

Learning Outcomes: Student will be able to

Apply neural networks to pattern classification and regression problems.(L3)

Effectively use existing software tools to solve real problems using a soft computing approach.(L3)

To be able to solve Engineering problems using decision tree learning algorithms.(L3)

Text Books

Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy and J. Anuradha –Cengage Learning.

Neural networks A comprehensive foundations, Simon Haykin, Pearson Education2nd edition2004

Neural Networks, Fuzzy Logic, Genetic Algorithms: Synthesis and Applications byRaja sekharan and Pai, PHI Publications

Machine Learning, Tom M. Mitchell, MGH.

Reference Books

S. N. Sivanandam & S. N. Deepa, “Principles of Soft Computing”, 2nd edition, Wiley India, 2008.

David E. Goldberg, “Genetic Algorithms-In Search, optimization and Machine learning”,Pearson Education.

Simon Haykin , “Neural Networks: A Comprehensive Foundation “, PHI Publication.

C. Eliasmith and CH. Anderson, “Neural Engineering “, PHI.

John Yen and Reza Langari , “Fuzzy Logic¨ Intelligence, Control and Information”,Pearson Publication.

COURSE OUTCOMES VS POs MAPPING (DETAILED: HIGH: 3, MEDIUM: 2, LOW: 1)

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Cos	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	2	1	1	1				1		2	2	2	1
CO2	3	3	2	2	2	1				1		1	3	3	2
CO3	3	3	2	1	2	1				1		1	2	3	2
CO4	3	3	3	2	3	1				1		2	3	3	3
CO5	3	3	3	2	2	1				2		2	3	3	2
CO*	3	3	2	2	2	1				1		2	3	3	2

*For Entire Course, PO & PSO Mapping

Year : IV Semester : I

Subject Code	Subject Name	L	T	P	C
	Software Architecture & Design Patterns	3	0	0	3

Course Objectives:

- The course should enable the student to:
- To understand interrelationships, principles, and guidelines governing architectureand evolution over time.
- To understand various architectural styles of software systems.
- To understand design patterns and their underlying object-oriented concepts.
- To understand the implementation of design patterns and provide solutions to real-world software design problems.
- To understand patterns with each other and understand the consequences ofcombining patterns on the overall quality of a system.

Course Outcomes:

- Understand the importance of Software Architecture with various reference modelsand documenting architectures.
- Evaluation of architectures with appropriate decision-making by the system architect.
- Analyze how problems can be solved using design patterns.
- Apply the structural design patterns for various real-time examples
- Evaluate the case study of design patterns to solve the complex problems

UNIT-I

Envisioning Architecture: The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures, and views.

Creating and Architecture: Quality Attributes, Achieving qualities, Architectural styles andPatterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

Learning Outcomes: Students will be able to

Understand the necessity of the Architecture Business Cycle and the importance ofSoftware Architecture.

Understand software architecture with various reference models.

Understand documenting software architectures.

Analyze the Quality Attributes.

Applications:

Architectures are influenced by ABC

System stakeholders

Developing organization

Experience of the architect

UNIT-II

Analyzing Architectures: Architecture Evaluation,Architecturedesign, decisionmaking, ATAM, CBAM, SAAM

Moving from One System to Many: Software Product Lines, Building systems from the shelf components, Software architecture in the future.

Learning Outcomes: Students will be able to

- Understand Architecture Evaluation.
- Understand different analysis models.
- Analyze Architecture design decision-making.
- Analyze how software architectures can be used in different software applications.

Applications:

Analyzing Architecture is influenced by MVC architecture etc.,

UNIT-III

Patterns: Pattern Description, Organizing catalogs, role in solving design problems, Selection, and usage.

Creational Patterns: Singleton Pattern, Factory method Pattern, Abstract factory Pattern, Builder Pattern, Prototype Pattern.

Learning Outcomes: Students will be able to

- Understand what the use of design patterns is.
- Analyze how problems can be solved using design patterns.
- Analyze how to use creational design patterns for different problems.
- Evaluate whether the product design can be independent or not.

Applications:

Selection & Usage of Design patterns can be solved by

Usage of MVC architecture for developing web applications.

UNIT-IV

Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, &PROXY.

Learning Outcomes: Students will be able to

- Understand the structure of design patterns.
- Analyze how classes and objects are composed to form large structures.
- Understands the logic of design patterns.

Applications:

The result is a class that combines the properties of its parent classes. This pattern is particularly useful for making

independently developed class libraries work together.

UNIT-V

Behavioral Patterns: Chain Of Responsibility, Iterator, Mediator, Memento, Observer, State, Strategy, &Visitor. The World Wide Web - a case study in Interoperability, The Nightingale System: A Case Study in Applying the ATAM, Celsius Tech – a case study in Product line development.

Learning Outcomes: Students will be able to

- Analyze responsibilities between objects of classes.
- Apply complex control flow in applications.
- Analyze various dependencies between objects with respect to classes.

Applications:

The implementation of various Case Studies can be done by

Quality of application (for various Real – Time Examples) can be observed in weband desktop applications.

Contemporary Topics: Command, Interpreter, Template Method

Text Books

- Software Architecture in Practice, 4th edition, Len Bass , Paul Clements, Rick Kazman , Published by Addison-Wesley Professional (December 15th 2021) - Copyright © 2022.
- Design Patterns, Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides , Published by Pearson Education, 1January 2008..

Reference Books

- Beyond Software architecture, Luke Hohmann, Addison Wesley, 2003.
- Software architecture, David M. Dikel, David Kane and James R. Wilson, PrenticeHall PTR, 2001
- Software Design, David Budgen, second edition, Pearson education, 2003
- Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.

COURSE OUTCOMES VS POs MAPPING (DETAILED: HIGH: 3; MEDIUM: 2; LOW: 1**):**

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	3	2	2	2	2				2			2	2	2	
CO2	3	2	2	3	2				2			2	2	2	
CO3	3	2	2	2	2				2			2	2	2	
CO4	3	2	2	3	2				3			2	2	2	2
CO5	3	2	2	2	2				3			2	2	2	2

CO*	3	2	2	2	2				3			2	2	2	2

Year : IV Semester : I

Subject Code	Subject Name	L	T	P	C
	COMPUTER VISION	3	0	0	3

Course Objectives:

- Understand the Fundamentals of Computer Vision and Image Processing
- Apply Image Processing Techniques for Visual Data Enhancement and Transformation
- Develop Competence in Feature Detection, Matching, and Image Stitching
- Analyze and Segment Visual Data for Object Detection and Tracking
- Apply Deep Learning Techniques for Advanced Computer Vision Tasks

Course Outcomes:

- Understand image formation and representation fundamentals.
- Apply filtering and transformation techniques to process images.
- Apply feature detection and matching using classical algorithms.
- Analyze and implement object detection and recognition systems.
- Apply deep learning methods for complex vision tasks.

UNIT I

Introduction to Computer Vision

Overview of Computer Vision: Definition: Scope, and Applications: Human vs. Computer Vision: Real-world Use Cases: Surveillance, Medical Imaging, Robotics, AR/VR

Digital Image Fundamentals: Image formation and sensing: Pixels, Image resolution, Aspect ratios: Color models: RGB, Grayscale, HSV

Image Representation and File Formats: Bitmap, JPEG, PNG: Metadata and EXIF

OpenCV and Numpy Basics: Loading, displaying, and saving images:Basic operations: image slicing, resizing, type conversion

UNIT II

Image Processing and Transformations

Point Processing Techniques: Contrast Stretching, Log and Gamma Transformations: Histogram Equalization (Global and CLAHE)

Filtering and Convolution: Linear filters: Smoothing, Averaging: Non-linear filters: Median, Bilateral

:Edge Detection: Sobel, Prewitt, Laplacian, Canny

Image Pyramids: Gaussian and Laplacian Pyramids: Applications: Blending, Compression

Geometric Transformations: Translation, Rotation, Scaling: Affine and Perspective Transforms: Image warping and remapping

UNIT III

Feature Detection and Matching

Keypoint Detection: Harris Corner Detection: Shi-Tomasi and FAST

Feature Descriptors: SIFT (Scale Invariant Feature Transform): SURF (Speeded Up Robust Features): ORB (Oriented FAST and Rotated BRIEF)

Feature Matching Techniques: Brute-Force Matcher: FLANN (Fast Library for Approximate Nearest Neighbors)

Homography and Image Stitching: Computing Homography matrix: Warping and blending multiple views

UNIT IV

Segmentation and Object Detection

Image Segmentation Techniques: Thresholding: Global, Adaptive, and Otsu's Method:Edge-Based Segmentation: Region-Based Segmentation: Region Growing, Watershed

Contour Detection and Shape Analysis: Contour approximation, convex hull:Shape descriptors: Area, Perimeter, Circularity

Motion Analysis and Tracking: Frame differencing and Background Subtraction: Optical Flow: Lucas- Kanade, Farneback: Object Tracking: Kalman Filter, MeanShift, CamShift

Object Detection Techniques: Haar Cascades: Histogram of Oriented Gradients (HOG) + SVM

UNIT V

Deep Learning for Computer Vision:

Convolutional Neural Networks (CNNs): Architecture: Convolution, Pooling, Fully Connected Layers: Activation functions, Loss functions: CNN design and training

Pre-trained Models and Transfer Learning: VGG, ResNet, MobileNet: Fine-tuning and feature extraction **Object Detection with Deep Learning**: R-CNN, Fast R-CNN, Faster R-CNN: YOLO (You Only Look Once): SSD (Single Shot Detector)

Face Recognition: Face detection: MTCNN, OpenCV Haar: Embeddings: FaceNet, DeepFace: Applications and evaluation

Emerging Topics (Overview): Vision Transformers (ViT): Explainable AI in Vision Systems: Zero-shot learning and multimodal vision

COURSE OUTCOMES VS POs MAPPING (DETAILED: HIGH: 3, MEDIUM: 2, LOW: 1)

CO PO PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	2	1		1	1	1	1	2	3	2	2
CO2	3	3	2	2	3	1		1	1	1		2	3	3	2
CO3	3	3	2	2	3	1			1		1	2	3	3	2
CO4	3	3	3	3	3			1	2	2	2	3	3	3	3
CO5	3	3	3	3	3	1			2	2	2	3	3	3	3
CO6	3	3	3	3	3	2		1	2	3	3	3	3	3	3

Year : IV Semester : I

Subject Code	Subject Name	L	T	P	C
	Human Computer Interaction	3	0	0	3

Course Objectives:

- To get student to think constructively and analytically about how to design andevaluate user Interface.
- Describe the various styles and interactive devices in designing.
- Analyze the quality and different strategies in language processing.
- Study the HCI Evaluation through expert analysis.
- Apply different search patterns on data.

Course Outcomes:

- Understand the capabilities of user Interface.
- Understand the human–computer interaction (HCI) models
- Apply an interactive design process and universal design principles to designing HCIsystems.
- Understand HCI Evaluation through expert analysis.
- Analyzed tasks and dialogs of relevant HCI systems based on task analysis and dialogdesign.

Unit 1

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

Learning Outcomes: Student will be able to

- Describe the basic concepts of user Interface.(L1)
- Analyze the basic good design and development methods.(L2)

Applications: useful for managing design process.

Unit 2

Menu Selection, Form Fill-In and Dialog Boxes: Introduction, Task- Related Menu Organization, Single menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data entry with Menus: Form Fill-in, dialog Boxes, and alternatives, Audio Menus and menus for Small Displays.

Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays- Small and large.

Learning Outcomes: Student will be able to

- Describe utilisation of menus &dialog boxes.(L1)

- Analyse the interactive devices.(L2)

Applications:

useful for designing of menus & dialog boxes in newly developed user applications.

Unit 3

Command and Natural Languages: Introduction, Command organization Functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in Computing

Quality of Service: Introduction, Models of Response-Time impacts, Expetations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences

Learning Outcomes: Student will be able to

- Describe structure & strategies of natural language computing.(L2)
- Analyse working quality of designed applications.(L2)

Applications: useful for verifying quality of service by taking certain parameters.

Unit 4

HCI in the software process, The software life cycle Usability engineering Iterative design and prototyping

Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction

Learning Outcomes: Student will be able to

- Analyze and design Software life cycle methods.(L3)
- Analyze the HCI Evaluation through expert analysis .(L3)

Applications: useful for designing of different pages, documentation for each application

Unit 5

Information Search: Introduction, Searching in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Searching Interfaces Information Visualization: Introduction, Data Type by Task Taxonomy, Challenges for Information Visualization

Learning Outcomes: Student will be able to

Analysis of information search in textual documentation.(L3)

Applications: Easy to apply information search in all categories.

Text Books:

- The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech.
- Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education.

- Designing the User Interface, Strategies for Effective Human Computer Interaction, 5ed,
- Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven M Jacobs, Pearson
- The Essential guide to user interface design,2/e, Wilbert O Galitz, Wiley Dreama Tech.

Reference Books:

- Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia.
- .Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.
- Human Computer, Interaction Dan R.Olsan, Cengage ,2010.
- Designing the user interface. 4/e, Ben Shneidermann , PEA.
- User Interface Design, Soren Lauesen , PEA.
- Interaction Design PRECE, ROGERS, SHARPS, Wiley

COURSE OUTCOMES VS POs MAPPING (DETAILED: HIGH: 3, MEDIUM: 2, LOW: 1)

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

*For Entire Course, PO & PSO Mapping

Year : IV Semester : I

Subject Code	Subject Name	L	T	P	C
	Natural Language Processing	3	0	0	3

Course Objectives:

- Explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP)
- Discuss approaches to syntax and semantics in NLP.
- Examinecurrentmethodsforstatisticalapproachestomachinetranslation.
- Explore machine learning techniques used in NLP.

Course Outcomes :

- Understand basics of NLP techniques
- Analyze top-down and bottom-up parsing approaches
- Analyze various grammars on NLP
- Analyze semantic interpretation models and language models
- Apply machine translation, multilingual information retrieval, and summarization techniques

UNIT I

Introduction to Natural language

The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.

Learning Outcomes:

- At the end of the module, students will be able to:
- Classify various NLP Applications(L2)
- Apply the logic by using Python Programming(L3)
- List the AI Languages(L1)
- Outline the Linguistic Background(L2)

Unit II

Grammars and Parsing

Grammars and Parsing- Top- Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayees Rule, Shannon game, Entropy and Cross Entropy.

Learning Outcomes:

At the end of the module, students will be able to:

Demonstrate the Top-Downand Bottom-Up Parsing techniques(L2)

Apply Bayes Rule, Shannon game, Entropy and Cross Entropy. (L3).

Develop game playing strategies using Shannon game. (L3)

UNIT III

Grammars for Natural Language

Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

Learning Outcomes:

At the end of the module, students will be able to:

- Classify Grammars for Natural Language(L2)
- Explain Hold Mechanisms in ATNs.(L2)
- Explain Human Preferences in Parsing.(L2)

UNIT IV

Semantic Interpretation

Semantic &Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts & embedded sentences, Defining semantics structure model theory.

Language Modeling

Introduction,n-GramModels,LanguagemodelEvaluation,ParameterEstimation,Language

Model Adaption, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling.

Learning Outcomes:At the end of the module, students will be able to:

- Distinguish Language model Evaluation(L4)
- List the types of Language Models(L1)

UNIT V

Machine Translation

Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting

the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.Multilingual Information Retrieval Introduction,DocumentPreprocessing,MonolingualInformationRetrieval,CLIR,MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.Multilingual Automatic Summarization Introduction,ApproachestoSummarization,Evaluation,HowtoBuildaSummarizer, Competitions and Datasets.

Learning Outcomes:

At the end of the module, students will be ableto:

- Apply Machine Translation techniques. (L3)
- Elaborate Multilingual Information Retrieval and MultilingualAutomatic Summarization. (L6)

Textbooks:

- James Allen, Natural Language Understanding, 2ndEdition, 2003,Pearson Education.
- Multilingual Natural Language Processing Applications: From Theory To Practice- Daniel M.Bikel and Imed Zitouni, Pearson Publications.
- Natural LanguageProcessing, A Panini an perspective, AksharBharathi, Vineetchaitanya,Prentice –Hall of India.

References books:

- Charniack, Eugene, Statistical Language Learning, MIT Press,1993.
- Jurafsky, Danand Martin, James,Speech and Language Processing,2nd Edition,Prentice Hall, 2008.
- Manning, Christopher and Henrich, Schutze, Foundations of StatisticalNaturalLanguage Processing, MIT Press, 1999.

COURSE OUTCOMES VS POs MAPPING (DETAILED: HIGH: 3, MEDIUM: 2, LOW: 1)

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

CO*	3	3	2	2	1	2	1	3	3	2	2	3	2	2	3

*For Entire Course, PO & PSO Mapping

Year : IV Semester : I

Subject Code	Subject Name	L	T	P	C
	React JS Framework (Skill Oriented Course)	0	1	2	2

Course Objectives:

- To learn essential React JS skills for front-end development.
- To explore client-side JavaScript application development and the React library.
- To implement React components, hooks, and state management for building interactive UIs.
- To gain experience with React.js, JSX, HTML, CSS, and JavaScript.
- To create a functional front-end web application using React.

Course Outcomes:

- Understand the anatomy of React Java Script. (L2)
- Understand the life cycle methods of React JS. (L2)
- Implement React components for building applications. (L3)
- Apply React hooks for component reusability and monitoring. (L3)
- Implement React rendering for interactive applications. (L3)

UNIT 1

React JS: Introduction to React JS, React vs Angular, React Version History, Architecture of the React Application, Installation, Creating and Running React App, Anatomy of React Project.

Templating using JSX: Expressions, Operators, Attributes, Fragments.

Learning Outcomes: Student will be able to

- Understand react framework for building applications. (L2)
- Understand the installations of react packages. (L2)
- Implement templates in react applications. (L3)

React Core: Props, State, Event Handling, Lists and Keys, Styling, Pagination, React Life Cycle, Life Cycle Methods, State Management, Mounting Life Cycle.

Learning Outcomes: Student will be able to

- Understand event handling in React. (L2).
- Implement life cycle methods in react. (L3).
- Implement props and states in building react apps. (L3)

UNIT 3

React Components: Pure Components, memo, Refs, Portals, Higher Order Components (HOC), Context, HTTP requests (POST & GET).

Learning Outcomes: Student will be able to

- Understand http request methods in handling end points. (L2)
- Implement components to handle react requests. (L3)
- Implement higher order components and refs in react. (L3)

UNIT 4

React Hooks: Introduction to Hooks, useState, useEffect, Run Effects, Fetching Data, useContext, useReducer, useCallBack, useMemo, useRef, Custom Hooks

Learning Outcomes: Student will be able to

- Understand react hooks. (L2)
- Apply hooks and custom methods for handling components. (L3)
- Implement context and callback methods in hooks. (L3)

UNIT 5

React Render: Introduction to Rendering, useState, useReducer, State Immutability, Parent & Child, Memo, Context, useCallBack.

Learning Outcomes: Student will be able to

- Understand the working react rendering. (L2)
- Implement userReducer and context for rendering react apps. (L3)

CONTEMPORARY TOPICS:

React - Http client programming

React - Form programming

React - Routing

React - Redux

React - Animation

APPLICATIONS:

Online Web Applications

Financial, Banking Applications and Gateways etc

Online and Social Media Applications

Text Books:

- React.js Book: Learning React JavaScript Library From Scratch by Greg Sidelnikov, Learning Curve.
- React: Quickstart Step-By-Step Guide To Learning React Javascript Library (React.js, Reactjs, Learning React JS, React Javascript, React Programming) by Lionel Lopez

Reference Books:

Full-Stack React Projects: Learn MERN stack development by building modern web apps using MongoDB, Express, React, and Node.js, 2nd Edition by Shama Hoque, Packt

COURSE OUTCOMES VS POs MAPPING (DETAILED: HIGH: 3, MEDIUM: 2, LOW: 1)

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

*For Entire Course, PO & PSO Mapping

Year : IV Semester : I

Subject Code	Subject Name	L	T	P	C
	ENTREPRENEURSHIP AND INCUBATION	2	0	0	0

Course Objectives:

- Outline an environment to inculcate entrepreneurial skills.(L2)
- Develop innovative products, services, processes and techniques.(L3)
- Plan to prepare financial proposals and start-ups.(L3)
- Analyse the ideas to collaborate entrepreneur skills in establishment of start-ups.(L4)
- Explain the financial resources existing in government and private sectors.(L2)

Course outcomes:

- Explain the knowledge of Entrepreneurial behavior and skill development.(L2)
- Choose business ideas that have value in the end-market.(L2)
- Identify the validity of idea and its unique selling proportion.(L3)
- Comprehend opportunity and challenges of-start up (L3)
- Analyze various Government and non-Government financial resources.(L2)

Unit I:

Fundamentals of Entrepreneurship:Entrepreneurship-Concept, Importance, Characteristics –Myths and Traits of Entrepreneurship -Entrepreneurial Ecosystem– Manager Vs Entrepreneur- Social and Ethical Perspectives of Entrepreneurship-Women Entrepreneurship.

Application: Case lets: Business cases of young entrepreneurs. Learning Outcomes:

At the end of this unit students will be able to:

- Interpret the concepts of entrepreneurship and the characteristics of an entrepreneur. (L2)
- Explain the significance of entrepreneurship in the economic development of a nation.(L2)

Unit II:

Ideation and Evaluation of Business Ideas

Opportunity identification – Ideation process - Sources of business ideas – Role of creativity – Sources of Innovation –Technological Innovation and Entrepreneurship - Product/ Service design – Design Thinking-Entrepreneurs Eco-system-Networking

Case lets: Business cases of OYO.

Activity: Collection of novel business ideas.

Learning Outcomes:

At the end of this unit students will be able to:

- Choose the right business ideas. (L2)
- Evaluate the business idea. (L3)

Unit III:

Feasibility Analysis and Business plan

Thrust areas of entrepreneurship - Techno-economic feasibility assessment- Financial feasibility

Market feasibility – Legal Feasibility, Environmental analysis and regulations. Preparation of Business plan –Lean Startup Methodologies- Business canvas & Lean canvas.

Activity:

Preparation of business plan (draft)

Analysis on TEDx program Talks

Learning Outcomes:

- At the end of this unit students will be able to:
- Evaluate technical feasibility.(L3)
- Develop Business and Lean canvas. (L2)

Unit IV: Business Incubation and startups

Fundamentals of business incubation - Services of incubators - Start-ups-meaning, significance - start up strategy-Present scenario of startups. Role of startups in Indian economy-MSME- Idea Registration process-Pitching

Activity:

Evaluating new start-ups in India

Analysis on Shark Tank India program

Learning Outcomes:

- At the end of this unit students will be able to:
- Describe the process of business incubation/incubators (L2)
- Select a suitable incubator and build a feasible business model. (L3)

Unit V:

Financial resources

Sources of finance – Bootstrapping - Government Support – MSMEs-Crowd Funding– Venture Capitalists & Angel Investors - Schemes for women entrepreneurs

Activity: Identify different financial sources available for Funding

Learning Outcomes:

- At the end of this unit students will be able to:
- Knowledge about various sources of finance for entrepreneurship. (L2)
- Analyze the opportunities Seed capital /Angel financiers and understand operation.(L2)

Text Books:

- T.V Rao, Donald F. Kuratko, Entrepreneurship, A South-Asian Perspective, Cengage Learning, 2012
- Datsy Davies, Indian Startups, Amazon Asia-Pacific Holdings Private Limited, 2016

Reference Books:

- P.N.Rath, Sarjue Pandita, Entrepreneurship: Startup India & Stand up India, Lexicon Publishing House, 2018
- MadhurimaLall, Shikha Sahai, Entrepreneurship, Excel Books (P) Ltd. 2008
- Rajeev Roy, Entrepreneurship, Oxford Higher Education. 2011
- H. Nandan, Fundamentals of Entrepreneurship, PHI Learning (P) Ltd, 2013

Web Resources:

https://www.startupindia.gov.in

https://strategyzer.com/canvas/business-model-canvas

https://canvanizer.com/new/lean-canvas https://msme.gov.in/

https://t-hub.co/ http://www.apinnovationsociety.com/index.php

https://aim.gov.in/atal-incubation-centres.php

https://nptel.ac.in/courses/110/106/110106141/