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Bachupally, Hyderabad -500 090

Department of Computer Science and Engineering

Course Outcomes and CO-PO Mapping (R22 Regulations)

Year and Sem: II - I

JNTUH Course Name: Data Structures

Course Code: CS302PC

CO No.	Course Outcomes
Data Structures – CS302PC	
C212.1	Implement various operations on linear data structures to solve real world problems.
C212.2	Design solutions using Dictionaries, Hash Tables and time complexity.
C212.3	Implement various kinds of trees and its operations.
C212.4	Describe graph representations and implement traversals.
C212.5	Implement various sorting algorithms.
C212.6	Demonstrate the Pattern matching algorithms and Tries.

Course Name: Computer Organization and Architecture

JNTUH Course Code: CS304PC

CO No.	Course Outcomes
Computer Organisation and Architecture - CS304PC	
C214.1	Implement Micro operations in Design, Organization and Architecture of a basic computer.
C214.2	Design a suitable Control unit for a decided set of Instructions.
C214.3	Design Hardware and Algorithms for manipulation of data, represented in different formats.
C214.4	Implement data transfer with appropriate IO Interface and Interrupt mechanism.
C214.5	Choose suitable type of Memory for given purpose
C214.6	Perform Parallel Processing using suitable mechanism

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Department of Computer Science and Engineering

Course Outcomes and CO-PO Mapping (R22 Regulations)

Year and Sem: II - I Sem

Course Name: Object Oriented Programming through JAVA

JNTUH Course Code: CS305PC

CO No.	Course Outcomes
Object Oriented Programming through JAVA – CS305PC	
C215.1	Illustrate Object Oriented concepts and basics of java programming.
C215.2	Explore the concepts of Inheritance, packages and Interfaces.
C215.3	Implement the concepts of exception handling and utilization.
C215.4	Apply the knowledge of multithreading to solve problems related to IPC.
C215.5	Design GUI applications using event handling concepts & AWT.
C215.6	Develop look and feel GUI applications using applets and swing.

Course Name: Data Structures Lab

JNTUH Course Code: CS306PC

CO No.	Course Outcomes
Data Structures Lab – CS306PC	
C216.1	Implement various kinds of linked lists and their operations.
C216.2	Design programs to implement stack and queue ADT.
C216.3	Implement programs for sorting algorithms.
C216.4	Implement trees and graph traversal and pattern matching algorithms.

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Department of Computer Science and Engineering

Course Outcomes and CO-PO Mapping (R22 Regulations)

Year and Sem: II - I Sem

Course Name: Object Oriented Programming through Java Lab

JNTUH Course Code: CS307PC

CO No.	Course Outcomes
Object Oriented Programming through Java Lab – CS307PC	
C217.1	Make use of JDK, Eclipse platform for developing java programs using Oops.
C217.2	Build programs using abstract classes and multithreading concepts.
C217.3	Develop programs using GUI components and event handling.
C217.4	Design look and feel GUI using swing and applets.

Course Name: Data visualization- R Programming/ Power BI

JNTUH Course Code: CS308PC

CO No.	Course Outcomes
Data Visualization Lab – CS308PC	
C218.1	Understand Tableau fundamentals.
C218.2	Implement visualizations and layouts.
C218.3	Explain real world problems by creating GUI using Frames and panels.
C218.4	Create custom charts

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Course Outcomes and CO-PO Mapping (R22 Regulations)

Year and Sem: II -II

Course Name: Discrete Mathematics

Course Code: CS401PC

CO No.	Course Outcomes
Discrete Mathematics – CS401PC	
C221.1	Apply mathematical logic to prove reason and infer the statements.
C221.2	Model the mathematical problems using sets, functions and relations.
C221.3	Demonstrate the usage of groups and subgroups.
C221.4	Apply combinations and permutations to the relevant problems.
C221.5	Make use of Binomial and Multinomial theorems appropriately.
C221.6	Construct the graphs and trees to model the real-world problems.

Course Name: Business Economics and Financial Analysis

Course Code: SM402MS

CO No.	Course Outcomes
Subject Name – Business Economics and Financial Analysis – SM504MS	
1	Understand the Economic Concepts in the business decision making process.
2	Familiarize with the cost concepts, market structures.
3	Make use of break-even analysis, CVP Analysis, pricing strategies.
4	Examine financial accounting and analyze various financial statements.
5	Interpret various financial statements by applying different types of ratios.
6	Examine the usefulness of Investment decisions of a company.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 - Regulations)
Year and Sem: II -II

Course Name: Operating Systems

Course Code: CS403PC

CO No.	Course Outcomes
Operating Systems - CS403PC	
C223.1	Analyze the functionalities and structure of a generic Operating System.
C223.2	Evaluate various CPU scheduling algorithms.
C223.3	Analyze process synchronization and IPC mechanisms.
C223.4	Assess the techniques of deadlock avoidance and prevention.
C223.5	Examine different Memory management techniques.
C223.6	Explore file system interface and its operations.

Course Name: Database Management Systems

Course Code: CS404PC

CO No.	Course Outcomes
Database Management Systems – CS404PC	
C404.1	Identify and classify the components of Database system
C404.2	Model the data using ER model and convert into Relational Model.
C404.3	Access and manipulate the data in the databases.
C404.4	Refine the database schema to improve data consistency.
C404.5	Ensure the properties of transactions on Databases.
C404.6	Examine different file organizations and indexing methods.

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Department of Computer Science and Engineering

Course Outcomes and CO-PO Mapping (R22 Regulations)

Year and Sem: II and II

Course Name: Software Engineering

Course Code: CS405PC

CO No.	Course Outcomes
Software Engineering – CS405PC	
CS225.1	Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
CS225.2	Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
CS225.3	Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
CS225.4	Will have experience and/or awareness of testing problems and will be able to develop a simple testing report
CS225.5	Analysis the risk factors and create the risk rectification plans to improve the quality.
CS225.6	Identify the factors to improve quality based on all concepts and apply in real time case study.

Course Name: Operating Systems Lab

Course Code: CS406PC

CO No.	Course Outcomes
Operating Systems **Laboratory – CS406PC**	
C226.1	Evaluate CPU Scheduling Algorithms and Memory management techniques.
C226.2	Construct deadlock detection and avoidance algorithms.
C226.3	Solve classical problems of synchronization using semaphores.
C226.4	Evaluate inter process communication mechanisms using system calls and pipes.

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Course Outcomes and CO-PO Mapping (R22 Regulations)

Year and Sem: II-II

Course Name: Database Management Systems

Course Code: CS407PC

CO No.	Course Outcomes
Database Management Systems Laboratory – CS407PC	
C407.1	Design conceptual model (E-R model) for the given database.
C407.2	Formulate the queries using DML, DDL, DCL commands.
C407.3	Enforce integrity constraints on databases.
C407.4	Implement triggers, stored procedures and cursors.

Course Name: Node JS/React JS/DJango

Course Code: CS409PC

CO No.	Course Outcomes
Node JS/React JS/DJango – CS409PC	
CS229.1	Build a custom website with HTML, CSS, and Bootstrap and little JavaScript.
CS229.2	Demonstrate Advanced features of JavaScript and learn about JDBC.
CS229.3	Develop Server – side implementation using Java technologies
CS229.4	Develop the server – side implementation using Node JS and Single Page Application using React.

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Department of Computer Science and Engineering

Course Outcomes and CO-PO Mapping (R22 Regulations)

Year and Sem: III -I

Course Name: Design and Analysis of Algorithms

Course Code: CS507PC

CO No.	Course Outcomes
Design and Analysis of Algorithms – CS501PC	
C311.1	Analyze the performance of the algorithms and represent using relevant notations.
C311.2	Apply the concepts of disjoint sets and priority queues to solve real world problems.
C311.3	Choose appropriate algorithmic design paradigms to solve various real world problems.
C311.4	Identify the issues in graph connectivity and resolve them.
C311.5	Reduce the search space of a problem using bounding functions.
C311.6	Categorize problems into NP hard & NP Complete.

Course Name: Computer Networks

JNTUH Course Code: CS502PC

CO No.	Course Outcomes
Computer Networks – CS502PC	
C312.1	Analyze pros and cons of the components, reference models and various transmission media.
C312.2	Analyze various link control and access control mechanisms available in the data link layer.
C312.3	Understand network layer principles, challenges, and routing algorithms to choose appropriate ones for different topologies.
C312.4	Manage the networks to ensure efficient, reliable, and high-quality communication.
C312.5	Assess the Transport layer protocols.
C312.6	Assess various features of the Application layer.

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Course Outcomes and CO-PO Mapping (R22 Regulations)

Year and Sem: III -I

Course Name: Dev Ops

JNTUH Course Code: CS503PC

CO No.	Course Outcomes
Dev Ops - CS503PC	
C313.1	Explore the various components of the DevOps environment.
C313.2	Identify Software development models and architectures of DevOps.
C313.3	Work with Source code management.
C313.4	Choose a project management tool.
C313.5	Use the Jenkins integration tool to build the application.
C313.6	Choose appropriate testing tools deployment model for the project.

Course Name: Quantum Computing (Professional Elective – I)

JNTUH Course Code: CS511PE

CO No.	Course Outcomes
Quantum Computing – CS511PE PE	
C314.1	Understand basics of quantum computing
C314.2	Implementation and understanding of mathematics basics and problem solution
C314.3	Understand physical implementation of Qubit
C314.4	Learning the basic Quantum basic and methods
C314.5	Understand Quantum algorithms and their implementation
C314.6	Understand The Impact of Quantum Computing on Cryptography

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Course Outcomes and CO-PO Mapping (BH23 Regulations)

Year and Sem: III -I

Course Name: Advanced Computer Architecture (Professional Elective – I)

JNTUH Course Code: CS512PE

CO No.	Course Outcomes
Advanced Computer Architecture – CS512PE	
C315.1	Identify different computational models and Computer Architectures.
C315.2	Analyze operation of parallel processing and memory hierarchy and the range of performance issues influencing its design.
C315.3	Classify the performance of different pipelined &non- pipelined processors.
C315.4	Analyze architectural features of advanced processors like Superscalar processors, multiprocessors.
C315.5	Analyze multiprocessors & thread level parallelism using shared, distributed memory models.
C315.6	Understand Vector Processing Principles, Multivector Multiprocessors and Compound Vector processing

Course Name: Data Analytics (Professional Elective – I)

JNTU Course Code: CS513PE

CO No.	Course Outcomes
DATA ANALYTICS – CS513PE	
C316.1	Understand the impact of data analytics for business decisions and strategy
C316.2	Carry out data analysis/statistical analysis
C316.3	To carry out standard data visualization and formal inference procedures
C316.4	Design Data Architecture
C316.5	Understand various Data Sources
C316.6	Visualize the data and interpret the insights exist in data

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Course Outcomes and CO-PO Mapping (R22Regulations)

Year and Sem: III -I

Course Name: Image Processing (Professional Elective – I)

JNTUH Course Code: CS514PE

CO No.	Course Outcomes
Image Processing – CS514PE	
C317.1	Understand the fundamentals of digital images and the relationship between pixels.
C317.2	Apply techniques for image enhancement and spatial filtering.
C317.3	Analyze the various image restoration techniques.
C317.4	Implement image segmentation methods.
C317.5	Evaluate image compression techniques to reduce redundancies.
C317.6	Integrate knowledge of digital image processing techniques to solve real-world problems and develop practical applications.

Course Name: Principles of Programming Languages (Professional Elective-1)

JNTUH Course Code: CS515PE

CO No.	Course Outcomes
Principles of Programming Languages – CS514ES	
C318.1	Understand the principles of programming domains
C318.2	Analyze the binding process relationship and type equivalence in programming Scenarios
C318.3	Identify and analyze the key design issues associated with subprograms.
C318.4	Determine the concepts of co-routines and abstract data types.
C318.5	Analyze various concurrency, exception handling and Event Handling
C318.6	Explore the features of various programming paradigms.

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Department of Computer Science and Engineering

Course Outcomes and CO-PO Mapping (R22Regulations)

Year and Sem: III -I

Course Name: Computer Graphics (Professional Elective – II)

JNTUH Course Code: CS521PE

CO No.	Course Outcomes
Computer Graphics – CS521PE	
C319.1	Explore applications of computer graphics
C319.2	Understand Two-Dimensional geometric transformations and viewing
C319.3	Determine the effects of Three-Dimensional objects Representation
C319.4	Understand Three-Dimensional geometric transformations viewing and clipping
C319.5	Analyze animation sequence
C319.6	Analyze Visible surface detection methods

Course Name: Embedded Systems (Professional Elective – II)

JNTUH Course Code: CS522PE

CO No.	Course Outcomes
Embedded Systems – CS522PE	
C31A.1	Identify the fundamental concepts of embedded systems.
C31A.2	Understand about architectures, device interfacing and handling interruptions.
C31A.3	Impart foundational knowledge and skills in on-board communication methods and protocols.
C31A.4	Develop expertise in embedded firmware programming using assembly language and C.
C31A.5	Analyze the core components of OS-based embedded systems.
C31A.6	Emphasize inter-process communication and concepts related to semaphore.

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Department of Computer Science and Engineering

Course Outcomes and CO-PO Mapping (R22 Regulations)

Year and Sem: III -I

Course Name: Information Retrieval Systems (Professional Elective – II)

JNTUH Course Code: CS523PE

CO No.	Course Outcomes
Information Retrieval Systems – CS523PE	
C31B.1	Understand Information Retrieval System functionalities and capabilities.
C31B.2	Choose appropriate data structure, file structure and indexing mechanism for efficient retrieval.
C31B.3	Differentiate among various classes of automatic indexing methods and clustering techniques.
C31B.4	Select suitable search technique based on the context.
C31B.5	Apply visualization techniques for efficient presentation of information.
C31B.6	Make use of the algorithms for different media data.

Course Name: Distributed Databases (Professional Elective – II)

JNTUH Course Code: CS512PE

CO No.	Course Outcomes
Distributed Databases– CS512PE	
C31C.1	Analyze the architecture and design of distributed database systems.
C31C.2	Explore the objectives and algorithms for distributed query processing.
C31C.3	Apply the mechanisms for concurrency control and deadlock management.
C31C.4	Evaluate the measures for distributed systems reliability and fault tolerance.
C31C.5	Choose the appropriate parallel database system architecture for implementation.
C31C.6	Implement distributed object database management and data management systems.

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Course Outcomes and CO-PO Mapping (R22 Regulations)

Year and Sem: III -I

Course Name: Natural Language Processing (Professional Elective – II)

JNTUH Course Code: CS525PE

CO No.	Course Outcomes
Natural Language Processing – CS525PE	
C31D.1	Explore the interconnection between document structure and different morphological models
C31D.2	Comprehend the representation of syntactic structures by utilizing treebanks for parsing natural language.
C31D.3	Apply appropriate parsing models to efficiently address ambiguity and multilingual contexts
C31D.4	Analyze semantic parsing principles and system paradigms to achieve accurate disambiguation of word senses.
C31D.5	Examine the structure of predicate arguments to establish meaningful representation systems.
C31D.6	Develop diverse language modeling techniques.

Course Name: Computer Networks Lab

JNTUH Course Code: CS504PC

CO No.	Course Outcomes
Computer Networks Laboratory – CS504PC	
C31E.1	Implement various Framing methods, Error Control methods and Sliding window protocols.
C31E.2	Analyze various protocols, operating system detection using appropriate monitoring tools.
C31E.3	Evaluate various routing protocols and congestion control mechanisms.
C31E.4	Evaluate the performance of routing protocols and IEEE 802.x standards using NS2 simulator.

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Course Outcomes and CO-PO Mapping (R22 Regulations)

Year and Sem: III -I

Course Name: Dev Ops Lab

JNTUH Course Code: CS505PC

CO No.	Course Outcomes
Dev Ops – CS505PC	
C31F.1	Practice Source code management using GIT
C31F.2	Build the environment for software application development using Jenkins.
C31F.3	Apply different project management, integration and development tools
C31F.4	Use different tools for automated testing of application

Course Name: UI design-Flutter

JNTUH Course Code: CS506PC

CO No.	Course Outcomes
Data Structures Lab – CS306PC	
C31H.1	Apply the basics of the Dart programming language, Flutter Widgets.
C31H.2	Create responsive UI Widgets using navigator in Flutter Applications.
C31H.3	Implement a form with various input fields and animations, along with validation and error handling.
C31H.4	Demonstrate Flutter Application using REST API and Flutter debugging tools.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: III - II

Course Name: Machine Learning

Course Code: CS601PC

CO No.	Course Outcomes
Machine Learning – CS601PC	
1	Understand the basic concepts of Machine Learning Techniques.
2	Apply the neural network concepts with Perceptron and Back Propagation
3	Evaluate various supervised, unsupervised learning algorithms with ensemble techniques.
4	Make use of Dimensionality Reduction concepts for model building.
5	Apply evolutionary computing algorithms approach for search and optimization.
6	Analyze the concepts of Reinforcement Learning for building autonomous Systems**.**

Course Name: Formal Languages and Automata Theory

Course Code: CS602PC

CO No.	Course Outcomes
Formal Languages and Automata Theory – CS602PC	
C322.1	Design FA machines, minimization, achieve conversions among them..
C322.2	Construct Regular expressions and Test for regular languages
C322.3	Analyze LMD,RMD derivations and convert grammar to finite automata and vice versa
C322.4	Design Pushdown Automata and normal forms for context free grammars.
C322.5	Design appropriate Turing Machine for a given problem
C322.6	Distinguish P ,NP problems and PCP problems

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: III-II

Course Name: Artificial Intelligence

Course Code: CS603PC

CO No.	Course Outcomes
Artificial Intelligence- CS603PC	
C603.1	Identify suitable search agents for problem solving.
C603.2	Apply adversarial search techniques on various problem domains.
C603.3	Make use of mathematical logic for knowledge representation and inference mechanisms.
C603.4	Construct real knowledge bases in various domains.
C603.5	Define the problem of planning in deterministic, fully observable and static environments.
C603.6	Apply Probabilistic Reasoning under uncertainty.

Course Name: Machine Learning Lab

Course Code: CS604PC

CO No.	Course Outcomes
Machine Learning – CS601PC	
1	Implement statistical concepts required for data analysis.
2	Analyze data, model, and model complexity and predict the trends.
3	Correlate various machine learning algorithms along with their strengths and weaknesses.
4	Build predictive models from data and analyze the model performance.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: III-II

Course Name: Artificial Intelligence Laboratory
Course Code: CS605PC

CO No.	Course Outcomes
Artificial Intelligence Laboratory - CS605PC	
C605.1	Demonstrate a deep understanding of fundamental search algorithms.
C605.2	Apply algorithmic techniques to implement games.
C605.3	Exhibit proficiency in solving complex problems through heuristic search algorithms
C605.4	Apply evaluation skills, to assess and select appropriate optimization techniques.

Course Name: Full Stack Development

JNTUH Course Code: CS631PE

CO No.	Course Outcomes
Full Stack Development – CS631PE	
C324.1	Understand the Full-stack components for developing web applications.
C324.2	Apply packages of NodeJS to work with Data, Files, HTTP Requests and Responses.
C324.3	Use MongoDB database for storing and processing huge data.
C324.4	Explore MongoDB database connection with NodeJS application.
C324.5	Design faster and more effective single-page applications using Express and Angular.
C324.6	Create interactive user interfaces with react components

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: III-II

Course Name: Internet of Things

JNTUH Course Code: CS632PE

CO No.	Course Outcomes
Internet of Things – CS632PE	
C325.1	Understand basic components in various IoT architectures
C325.2	Analyze different system management skills to address the challenges in implementation
C325.3	Apply Arduino programming skills for integration with the board.
C325.4	Make use of Python concepts to create solutions for diverse applications.
C325.5	Interface different components using Raspberry Pi board.
C325.6	Develop suitable solutions for the problems occurring in Industry.

Course Name: SCRIPTING LANGUAGES (Professional Elective – III)

JNTUH Course Code: CS633PE

CO No.	Course Outcomes
Scripting Languages – CS633PE	
C326.1	Make use of resources to gain some fluency programming in Ruby, Perl, TCL and TK
C326.2	Analyze the features of Ruby by embedding in different ways
C326.3	Understanding the Perl by utilizing the advanced features
C326.4	Explain syntax, variables and various features of TCL
C326.5	Elaborate strengths and weakness TCL and select an appropriate language for solving a given problem
C326.6	Examine the TK by embedding in different ways

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Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: III-II

Course Name: MOBILE APPLICATION DEVELOPMENT

JNTUH Course Code: CS634PE

CO No.	Course Outcomes
MOBILE APPLICATION DEVELOPMENT- CS634PE	
C327.1	Analyze the features, components and life cycle of Android Operating system
C327.2	Design Android application with UI components, Fragments and event handling
C327.3	Identify the importance of intents in Android applications development
C327.4	Develop Android applications using broadcasts and notifications
C327.5	Examine the data persistence mechanism using Files and Shared Preferences
C327.6	Develop Android application to perform operations with SQLite database

Course Name: Software Testing Methodologies

JNTUH Course Code: CS635PE

CO No.	Course Outcomes
Software Testing Methodologies – CS635PE	
C328.1	Analyze the basic concepts of software testing and its essentials and investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.
C328.2	Apply functional testing using control flow and transaction flow graphs.
C328.3	Test for a domain or an application and identify the nice and ugly domains.
C328.4	Choose appropriate path expression, KV charts, specifications and more testing strategies.
C328.5	Design and implement state graph, state testing, good state graph, bad state graph and their testability tips.
C328.6	Explain graph matrices, matrix properties and node reduction algorithms.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: III-II

Course Name: Fundamentals of Internet of Things

JNTUH Course Code: EC611OE

CO No.	Course Outcomes
Fundamentals of Internet of Things	
C329.1	Develop a clear comprehension of IoT and M2M concepts, facilitating the construction of IoT applications.
C329.2	Gain expertise in programming to configure Arduino boards for various designs.
C329.3	Effectively deploy python programs into Raspberry Pi boards in diverse scenarios.
C329.4	Demonstrate an understanding of data handling and analytics within Software-Defined Networking (SDN).
C329.5	Apply IoT concepts effectively for practical application development.
C329.6	Understand the role of cloud-computing in a typical IoT system with case studies.

Course Name: Full Stack Development Lab

JNTUH Course Code: CS631PE

CO No.	Course Outcomes
Full Stack Development Lab – CS631PE	
C32E.1	Design flexible and responsive Web applications using Node JS, React, Express and Angular.
C32E.2	Perform CRUD operations with MongoDB on huge amounts of data.
C32E.3	Develop real time applications using react components.
C32E.4	Use various full stack modules to handle http requests and responses.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: III-II

Course Name: Internet of Things Lab
JNTUH Course Code: CS632PE

CO No.	Course Outcomes
Internet of Things Laboratory – CS632PE	
C32F.1	Inference the impact and challenges posed by IoT networks leading to new architectural models.
C32F.2	Illustrate different sensor technologies for sensing real-world entities and identify the applications of IoT in Industry.
C32F.3	Appraise the role of IoT protocols for efficient network communication.
C32F.4	Elaborate Python programming with various interfacing devices using Raspberry PI.

Course Name: Scripting Languages Lab

JNTUH Course Code: CS633PE

CO No.	Course Outcomes
Scripting Languages Laboratory – CS633PE	
C32G.1	Script using the features of Perl Script
C32G.2	Solve the problems writing the appropriate Ruby Script
C32G.3	Apply the constructs of TCL using Tk to write the scripts.
C32G.4	Make use of the features of Shell scripts.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: III-II

Course Name: MOBILE APPLICATION DEVELOPMENT LAB

JNTUH Course Code: CS634PE

CO No.	Course Outcomes
MOBILE APPLICATION DEVELOPMENT LABORATORY – CS634PE	
C32H.1	Design Android User Interface using Layouts and components
C32H.2	Design android applications using menus, notifications and files
C32H.3	Develop Android application to persist data in Files, Shared Preferences and SQLite databases
C32H.4	Develop Android application based on Alarm and URL

Course Name: Software Testing Methodologies

JNTUH Course Code: CS635PE

CO No.	Course Outcomes
Software Testing Methodologies Lab– CS635PE	
C32I.1	Design and develop the best test strategies in accordance with the development model
C32I.2	Design and develop GUI, Bitmap and database checkpoints.
C32I.3	Develop database checkpoints for different checks
C32I.4	Perform batch testing with and without parameter passing

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: IV-I

Course Name: Cryptography & Network Security

Course Code: CS701PC

CO No.	Course Outcomes
Cryptography & Network Security-CS701PC	
CS701.1	Illustrate the concepts and principles of security Attacks, Services and Mechanisms.
CS701.2	Evaluate applications of Cryptographic algorithms in real time scenarios.
CS701.3	Demonstrate the techniques like Message authentication, Hash function and Public key encryption.
CS701.4	Solve the network security issues using available security solutions.
CS701.5	Assess different key management techniques and solutions for web security.
CS701.6	Analyze various case studies to identify the security vulnerabilities and prevention techniques.

Course Name: Compiler Design

Course Code: CS702PC

CO No.	Course Outcomes
Compiler Design – CS702PC	
C412.1	Illustrate the functionality of compiler phases.
C412.2	Apply practical aspects of automata theory.
C412.3	Design parsers for a given CFG.
C412.4	Construct SDT for various aspects including Intermediate Code.
C412.5	Make use of relevant storage organizations.
C412.6	Apply various code generation and optimization techniques.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: IV-I

Course Name: Cryptography & Network Security Lab

Course Code: CS703PC

CO No.	Course Outcomes
Cryptography & Network Security Lab – CS703PC	
CS703.1	Compare various cryptographic techniques to encode and decode the given text.
CS703.2	Develop solutions using symmetric key algorithms.
CS703.3	Build solutions using public key cryptographic algorithms.
CS703.4	Analyze various secure hash algorithms to generate hash key

Course Name: Compiler Design Lab

Course Code: CS704PC

CO No.	Course Outcomes
Compiler Design Lab – CS704PC	
C41F.1	Identify the practical approach of how a compiler works.
C41F.2	Implement top down and bottom up parsers.
C41F.3	Use lex and yacc tools for developing a scanner and a parser.
C41F.4	Implement various storage allocation strategies.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: IV-I

Course Name: Graph Theory

Course Code: CS741PE

CO No.	Course Outcomes
Graph Theory - CS741PE	
C413.1	Know some important classes of graph-theoretic problems and the usage of graph theory as a modeling tool.
C413.2	Formulate the central theorems about trees, matching, connectivity, coloring, and planar graphs.
C413.3	Describe some basic algorithms for graphs.
C413.4	The Graph theory as a Modeling tool presentable in Applications.
C413.5	Learn the fundamental concepts in graph theory in view of its applications in modern science and create mathematical proofs.
C413.6	Use the concepts of Graph theory in subsequent courses in the design and analysis of Graph algorithms.

Course Name: Cyber Security

Course Code: CS742PE

CO No.	Course Outcomes
Cyber Security- CS742PE	
C414.1	Understanding Cyber Security Fundamentals
C414.2	Analyzing Legal and Regulatory Aspects of Cyberspace
C414.3	Acquire skills in digital forensics, encompassing digital evidence analysis, forensic investigation methodologies, and challenges in computer forensics.
C414.4	Assessing Security Challenges in Mobile and Wireless Computing
C414.5	Evaluating Organizational Implications of Cyber Security
C414.6	Comprehend data privacy fundamentals, privacy attacks, policies across domains (e.g., medical, financial), and their implications for cyber security practices.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: IV-I

Course Name: SOFT COMPUTING

Course Code: CS743PE

CO No.	Course Outcomes
Soft Computing – CS743PE	
C415.1	Identify the difference between hard and soft computing
C415.2	Understand fuzzy logic and reasoning to handle and solve engineering problems
C415.3	Identify the difference between problem solving and decision making
C415.4	Implement the particle swarm optimizations for various applications
C415.5	Perform various operations of genetic algorithms, Rough Sets.
C415.6	Create various models to integrate soft computing techniques

Course Name: Cloud Computing

Course Code: CS744PE

CO No.	Course Outcomes
Cloud Computing – CS744PE	
C416.1	Understand various types of computing paradigms.
C416.2	Identify with cloud service types, cloud deployment models and technologies supporting and driving the cloud
C416.3	Acquire the knowledge of programming models for cloud and development of software application that runs the cloud and various services available from major cloud providers
C416.4	Apply the concept of virtualization and understand the importance of virtualization and how this has enabled the development of cloud computing.
C416.5	Acquire the knowledge of advances in cloud computing.
C416.6	Comprehend the security concerns and issues in cloud computing

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: IV-I

Course Name: Ad hoc & Sensor Networks

Course Code: CS745PE

CO No.	Course Outcomes
Ad hoc & Sensor Network – CS745PE	
C417.1	Apply the basic characteristics and routing in Mobile Ad-hoc Networks(MANETS)
C417.2	Analyze the data transmission in MANETs and the usage of TCP over MANETs and understand MANETs and WSN for Industry and research point
C417.3	Ability to solve the issues in real time application development based on Geocasting
C417.4	Demonstrate the ability to solve security related problems using Routing protocols
C417.5	Understand the basics of WSN and various layers
C417.6	Choose appropriate tools for WSN simulation

Course Name: Advanced Algorithms

Course Code: CS751PE

CO No.	Course Outcomes
Advanced Algorithms – CS751PE	
C418.1	Solve the complex problem using dynamic programming
C418.2	Analyze complex problems using advanced data structures (stacks, queues, linked lists, graphs and trees)
C418.3	Model real life problem using different algorithm design techniques
C418.4	Apply different design techniques to solve network related problems.
C418.5	Choose proper pattern matching algorithm for given problem
C418.6	Analyze NP and NP hard problems

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: IV-I

Course Name: Agile Methodologies

Course Code: CS752PE

CO No.	Course Outcomes
Agile Methodologies – CS752PE	
C419.1	Describe the evolution of Agile methodology, its principles, values, and practices, with emphasis on Extreme Programming (XP) and Scrum.
C419.2	Explain the roles, practices, and collaborative aspects of Agile teams including real customer involvement, pair programming, and effective communication techniques.
C419.3	Apply Agile practices for ensuring quality in software delivery such as continuous integration, version control, ten-minute build, and collective code ownership.
C419.4	Demonstrate Agile planning techniques including release planning, iteration planning, risk handling, and story estimation using the planning game.
C419.5	Implement Agile development practices like test-driven development (TDD), refactoring, spike solutions, and customer testing for incremental delivery
C419.6	Evaluate the suitability and effectiveness of Agile methods in different software development contexts through retrospectives and agility assessment.

Course Name: Robotic Process Automation

Course Code: **CS753PE**

CO No.	Course Outcomes
Robotic Process Automation- CS753PE	
C41A.1	Understand the concepts of Robotic Process Automation.
C41A.2	Apply the flow chart mechanism in various calculations.
C41A.3	Implement UI Path tool for debugging process
C41A.4	Design System managing techniques.
C41A.5	Describe how to handle the User Events and various types of Exceptions and strategies
C41A.6	Understand the Deployment of the Robot and to maintain the connection.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: IV-I

Course Name: Blockchain Technology

Course Code: CS754PE

CO No.	Course Outcomes
Blockchain Technology – CS754PE	
C41B.1	Demonstrate the technical knowledge to identify problems in the field of Information Technology and its allied areas.
C41B.2	Use literature to identify the objective, scope and the concept of the work.
C41B.3	Analyze and formulate technical projects with a comprehensive and systematic approach.
C41B.4	Identify the modern tools to implement technical projects.
C41B.5	Design engineering solutions for solving complex engineering problems.
C41B.6	Develop effective communication skills, professional behaviour and teamwork.

Course Name: Software Process and Project Management

Course Code: CS755PE

CO No.	Course Outcomes
Software Process and Project Management – CS755PE	
C41C.1	Analyze the Software process maturity levels for Process Improvement and Process Assessment.
C41C.2	Explore the Software Management Renaissance in Economics.
C41C.3	Evaluate Life cycle phases and Artifacts in Project Management.
C41C.4	Examine the role of workflows and checkpoints in process planning.
C41C.5	Illustrate the importance of Project Organization, Project control and process instrumentation in Project Management.
C41C.6	Evaluate the Project management practices with Case Studies.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: IV-I

Course Code : CS706PC
Course Name : Project Stage – I

CO No.	Course Outcomes
C41I.1	Identify problems, conduct literature surveys and formalize them.
C41I.2	Analyze and propose an efficient, cost-effective and eco-friendly solution using relevant tools and technologies.
C41I.3	Finalize the design plan and implement at least one module of the project.
C41I.4	Demonstrate effective communication and report writing skills.
C41I.5	Recognize the need for team work and exhibit professional ethics.
C41I.6	Identify problems, conduct literature surveys and formalize them.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: IV Year II Sem

Course Name: COMPUTATIONAL COMPLEXITY

Course Code: CS861PE

CO No.	Course Outcomes
COMPUTATIONAL COMPLEXITY – CS861PE	
C422.1	Analyze the computational complexity and classify algorithms into appropriate complexity classes.
C422.2	Construct reduction of problems.
C422.3	Analyze algorithmic paradigms and choose appropriate paradigms for a given problem.
C422.4	Choose appropriate randomized algorithms for pattern recognition.
C422.5	Compare various graph based algorithms for approximation and randomization problems.
C422.6	Apply suitable data structure for complex applications.

Course Name: Distributed Systems

Course Code: CS862PE

CO No.	Course Outcomes
Distributed Systems- CS862PE	
C862.1	Understand the fundamental concepts and challenges of distributed systems.
C862.2	Comprehend the operating system support required for distributed systems.
C862.3	Analyze peer-to-peer systems and global states in distributed systems.
C862.4	Understand and apply principles of coordination, agreement, and synchronization in distributed systems.
C862.5	Examine transaction management and concurrency control in distributed systems.
C862.6	Analyze replication and distributed shared memory concepts in distributed systems.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: IV Year II Semester

Course Name: Human Computer Interaction

Course Code: CS864PE

CO No.	Course Outcomes
Programming for Problem Solving – CS864ES	
CS429.1	Elaborate the design of good Interface and features of GUI
CS429.2	Understand the importance of a design and evaluation methodology
CS429.3	Apply visually pleasing composition of elements on screen design
CS429.4	Understand the social implications of technology and ethical responsibilities as engineers.
CS429.5	Design effective HCI for individuals
CS429.6	Ability to design certain tools for blind or PH people.

Course Name: Cyber Forensics

Course Code: CS865PE

CO No.	Course Outcomes
Cyber Forensics – CS865PE	
C426.1	Understand the fundamentals of Cyber Crime.
C426.2	Analyze the nature and effect of cybercrime in society.
C426.3	Demonstrate Accounting Forensics.
C426.4	Analyze Computer Crime and Criminals and Liturgical Procedures.
C426.5	Apply the laws and regulations to the applications.
C426.6	Examine the email tracking cyber applications.

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Department of Computer Science and Engineering
Course Outcomes and CO-PO Mapping (R22 Regulations)
Year and Sem: IV Year II Semester

Course Name : Project Stage - II

JNTUH Course Code : CS802PC

CO No.	Course Outcomes
C42A.1	Implement the remaining modules or features of the project complying with timelines.
C42A.2	Demonstrate the functionality of the project and evaluate the results.
C42A.3	Derive the conclusion to provide scope for future enhancement.
C42A.4	Integrate the findings of Stage-I & Stage-II and prepare a comprehensive report.
C42A.5	Exhibit technical, interpersonal and leadership skills with individual contribution.
C42A.1	Implement the remaining modules or features of the project complying with timelines.