

PROGRAMME: COMPUTER SCIENCE AND ENGINEERING (B.TECH)
JNTUK UNIVERSITY REGULATION R20
FIRST YEAR COURSES (I & II SEMISTER)
Course Outcome's (Co's)
I-I & I-II

C101	COMMUNICATIVE ENGLISH
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Course Outcomes (Cos)

C101.1	Understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
C101.2	Ask and answer general questions on familiar topics and introduce oneself /others
C101.3	Employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
C101.4	Recognize paragraph structure and be able to match beginnings/ endings/ headings with paragraphs
C101.5	Form sentences using proper grammatical structures and correct word forms

C102	MATHEMATICS-I
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Course Outcomes (Cos)

C102.1	solve the differential equations related to various engineering fields (L3)
C102.2	familiarize with functions of several variables which is useful in optimization (L3)
C102.3	apply double integration techniques in evaluating areas bounded by region (L3)
C102.4	students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems(L5)

C103	APPLIED PHYSICS
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Course Outcomes (Cos)

C103.1	Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2)
C103.2	➤ Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3).
C103.3	Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in onedimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2).

C104	PROGRAMMING FOR PROBLEM SOLVING USING C
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Course Outcomes (Cos)

C104.1	To write algorithms and to draw flowcharts for solving problems
C104.2	To convert flowcharts/algorithms to C Programs, compile and debug programs
C104.3	To use different operators, data types and write programs that use two-way/ multi-way selection
C104.4	To select the best loop construct for a given problem
C104.5	To design and implement programs to analyze the different pointer applications
C104.6	To decompose a problem into functions and to develop modular reusable code
C104.7	To apply File I/O operations

C105	COMPUTER ENGINEERING WORKSHOP
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Course Outcomes (Cos)

C105.1	Assemble and disassemble components of a PC
C105.2	Construct a fully functional virtual machine, Summarize various Linux operating system commands.
C105.3	Recognize characters & extract text from scanned images, Create audio files and podcasts.

C106	PROGRAMMING FOR PROBLEM SOLVING USING C LAB
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Course Outcomes (Cos)

C106.1	Gains Knowledge on various concepts of a C language.
C106.2	Able to draw flowcharts and write algorithms.
C106.3	Able design and development of C problem solving skills.
C106.4	Able to design and develop modular programming skills.
C106.5	Able to trace and debug a program.

C107	MATHEMATICS-II
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Course Outcomes (Cos)

C107.1	develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
C107.2	solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel
C107.3	evaluate the approximate roots of polynomial and transcendental equations by different algorithms
C107.4	apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals
C107.5	apply numerical integral techniques to different Engineering problems (L3)
C107.6	apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations

C108	APPLIED CHEMISTRY
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Course Outcomes (Cos)

C108.1	Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers
C108.2	Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion
C108.3	Synthesize nonmaterials for modern advances of engineering technology. Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors.
C108.4	Analyze the principles of different analytical instruments and their applications. Design models for energy by different natural sources
C108.5	Obtain the knowledge of computational chemistry and molecular machines

C109	COMPUTER ORGANIZATION
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Course Outcomes (Cos)

C109.1	Demonstrate and understanding of the design of the functional units of a digital computer system. Relate Postulates of Boolean algebra and minimize combinational functions
C109.2	Recognize and manipulate representations of numbers stored in digital computers
C109.3	Build the logic families and realization of logic gates
C109.4	Design and analyze combinational and sequential circuits
C109.5	Recall the internal organization of computers, CPU, memory unit and Input/Outputs and the relations between its main components
C109.6	Solve elementary problems by assembly language programming

C110	PYTHON PROGRAMMING
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Course Outcomes (Cos)

C110.1	Develop essential programming skills in computer programming concepts like data types, containers
C110.2	Apply the basics of programming in the Python language
C110.3	Solve coding tasks related conditional execution, loops
C110.4	Solve coding tasks related to the fundamental notions and techniques used in objectoriented programming

C111	DATA STRUCTURES
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Course Outcomes (Cos)

C111.1	Summarize the properties, interfaces, and behaviors of basic abstract data types
C111.2	Discuss the computational efficiency of the principal algorithms for sorting & searching .
C111.3	Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs.
C111.4	Demonstrate different methods for traversing trees

C112	APPLIED CHEMISTRY LAB
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Course Outcomes (Cos)

C112.1	The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.
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C113	PYTHON PROGRAMMING LAB
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Course Outcomes (Cos)

C113.1	Develop essential programming skills in computer programming concepts like data types, containers
C113.2	Apply the basics of programming in the Python language
C113.3	Solve coding tasks related conditional execution, loops
C113.4	Solve coding tasks related to the fundamental notions and techniques used in object oriented programming

C114	DATA STRUCTURES LAB
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Course Outcomes (Cos)

C114.1	Use basic data structures such as arrays and linked list.
C114.2	Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
C114.3	Use various searching and sorting algorithms.

C115	ENVIRONMENT SCIENCE
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Course Outcomes (Cos)

C115.1	Overall understanding of the natural resources.
C115.2	Basic understanding of the ecosystem and its diversity.
C115.3	Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
C115.4	An understanding of the environmental impact of developmental activities.
C115.5	Awareness on the social issues, environmental legislation and global treaties.

PROGRAMME: COMPUTER SCIENCE AND ENGINEERING (B.TECH)
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SECOND YEAR COURSES (I & II SEMISTER)
Course Outcome's (Co's)
II-I & II-II

C201	MATHEMATICS - III
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Course Outcomes (Cos)

C201.1	Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
C201.2	Estimate the work done against a field, circulation and flux using vector calculus (L5)
C201.3	Apply the Laplace transform for solving differential equations (L3)
C201.4	Find or compute the Fourier series of periodic signals (L3)
C201.5	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
C201.6	Identify solution methods for partial differential equations that model physical processes (L3)

C202	OBJECT ORIENTED PROGRAMMING THROUGH C++
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Course Outcomes (Cos)

C202.1	Classify object oriented programming and procedural programming
C202.2	Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
C202.3	Build C++ classes using appropriate encapsulation and design principles
C202.4	Apply object oriented or non-object oriented techniques to solve bigger computing problems

C203	OPERATING SYSTEMS
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Course Outcomes (Cos)

C203.1	Describe various generations of Operating System and functions of Operating System
C203.2	Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
C203.3	Solve Inter Process Communication problems using Mathematical Equations by various methods
C203.4	Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
C203.5	Outline File Systems in Operating System like UNIX/Linux and Windows

C204	SOFTWARE ENGINEERING
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Course Outcomes (Cos)

C204.1	Ability to transform an Object-Oriented Design into high quality, executable code
C204.2	Skills to design, implement, and execute test cases at the Unit and Integration level
C204.3	Compare conventional and agile software methods

C205	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
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Course Outcomes (Cos)

C205.1	Demonstrate skills in solving mathematical problems
C205.2	Comprehend mathematical principles and logic
C205.3	Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
C205.4	Manipulate and analyze data numerically and/or graphically using appropriate Software
C205.5	Communicate effectively mathematical ideas/results verbally or in writing

C206	OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB
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Course Outcomes (Cos)

C206.1	Apply the various OOPs concepts with the help of programs
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C207	OPERATING SYSTEM LAB
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Course Outcomes (Cos)

C207.1	To use Unix utilities and perform basic shell control of the utilities
C207.2	To use the Unix file system and file access control
C207.3	To use of an operating system to develop software
C207.4	Students will be able to use Linux environment efficiently
C207.5	Solve problems using bash for shell scripting

C208	SOFTWARE ENGINEERING LAB
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Course Outcomes (Cos)

C208.1	By the end of this lab the student is able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project
C208.2	prepare SRS document, design document, test cases and software configuration management and risk management related document.
C208.3	develop function oriented and object oriented software design using tools like rational rose.
C208.4	use modern engineering tools necessary for software project management, estimations, time management and software reuse
C208.5	generate test cases for software testing

C209	WEB APPLICATION DEVELOPMENT USING FULL STACK Frontend Development – Module -I
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Course Outcomes (Cos)

C209.1	Analyze a web page and identify its elements and attributes.
C209.2	Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet
C209.3	Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone
C209.4	Create web pages using HTML and Cascading Style Sheets.

C210	CONSTITUTION OF INDIA
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Course Outcomes (Cos)

C210.1	Understand historical background of the constitution making and its importance for building a democratic India.
C210.2	Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.
C210.3	Understand the value of the fundamental rights and duties for becoming good citizen of India.
C210.4	Analyze the decentralization of power between central, state and local self government.
C210.5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

C211	PROBABILITY AND STATISTICS
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Course Outcomes (Cos)

C211.1	Classify the concepts of data science and its importance (L4) or (L2)
C211.2	Interpret the association of characteristics and through correlation and regression tools (L4)
C211.3	Make use of the concepts of probability and their applications (L3)
C211.4	Apply discrete and continuous probability distributions (L3)
C211.5	Design the components of a classical hypothesis test (L6)
C211.6	Infer the statistical inferential methods based on small and large sampling tests (L4)

C212	DATABASE MANAGEMENT SYSTEMS
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Course Outcomes (Cos)

C212.1	Describe a relational database and object-oriented database
C212.2	Create, maintain and manipulate a relational database using SQL
C212.3	Describe ER model and normalization for database design
C212.4	Examine issues in data storage and query processing and can formulate appropriate solutions
C212.5	Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

C213	FORMAL LANGUAGES AND AUTOMATA THEORY
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Course Outcomes (Cos)

C213.1	Classify machines by their power to recognize languages.
C213.2	Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
C213.3	Employ finite state machines to solve problems in computing
C213.4	Illustrate deterministic and non-deterministic machines
C213.5	Quote the hierarchy of problems arising in the computer science

C214	JAVA PROGRAMMING
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Course Outcomes (Cos)

C214.1	Able to realize the concept of Object Oriented Programming & Java Programming Constructs
C214.2	Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
C214.3	Apply the concept of exception handling and Input/ Output operations
C214.4	Able to design the applications of Java & Java applet
C214.5	Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

C215	MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY
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Course Outcomes (Cos)

C215.1	The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
C215.2	The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
C215.3	The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
C215.4	The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
C215.5	The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

C216	DATABASE MANAGEMENT SYSTEMS LAB
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Course Outcomes (Cos)

C216.1	Utilize SQL to execute queries for creating database and performing data manipulation operations
C216.2	Examine integrity constraints to build efficient databases
C216.3	Apply Queries using Advanced Concepts of SQL
C216.4	Build PL/SQL programs including stored procedures, functions, cursors and triggers

C217	R PROGRAMMING LAB
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Course Outcomes (Cos)

C217.1	Access online resources for R and import new function packages into the R workspace
C217.2	Import, review, manipulate and summarize data-sets in R
C217.3	Explore data-sets to create testable hypotheses and identify appropriate statistical tests
C217.4	Perform appropriate statistical tests using R
C217.5	Create and edit visualizations with R

C218	JAVA PROGRAMMING LAB
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Course Outcomes (Cos)

C218.1	Evaluate default value of all primitive data type, Operations, Expressions, Control flow, Strings
C218.2	Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
C218.3	Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
C218.4	Construct Threads, Event Handling, implement packages, developing applets

C219	WEB APPLICATION DEVELOPMENT USING FULL STACK Frontend Development – Module -II
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Course Outcomes (Cos)

C219.1	develop of the major Web application tier- Client side development
C219.2	participate in the active development of cross-browser applications through JavaScript
C219.3	Develop JavaScript applications that transition between states

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THIRD YEAR COURSES (I & II SEMESTER)
Course Outcome's (Co's)
III-I & III-II

C301	COMPUTER NETWORKS
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Course Outcomes (Cos)

C301.1	Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
C301.2	Discuss different transmission media and different switching networks
C301.3	Analyze data link layer services, functions and protocols like HDLC and PPP.
C301.4	Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
C301.5	Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

C302	DESIGN AND ANALYSIS OF ALGORITHMS
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Course Outcomes (Cos)

C302.1	Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
C302.2	List and describe various algorithmic approaches and Solve problems using divide and conquer & greedy Method
C302.3	Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations.
C302.4	Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches
C302.5	Demonstrate NP- Completeness theory ,lower bound theory and String Matching

C303	DATA WAREHOUSING AND DATA MINING
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Course Outcomes (Cos)

C303.1	Illustrate the importance of Data Warehousing, Data Mining and its functionalities and Design schema for real time data warehousing applications.
C303.2	Demonstrate on various Data Preprocessing Techniques viz. data cleaning, data integration, data transformation and data reduction and Process raw data to make it suitable for various data mining algorithms.
C303.3	Choose appropriate classification technique to perform classification, model building and evaluation.
C303.4	Make use of association rule mining techniques viz. Apriority and FP Growth algorithms and analyze on frequent item sets generation.
C303.5	Identify and apply various clustering algorithm (with open source tools), interpret, evaluate and report the result.
C303.6	

C304	OPTIMIZATION IN OPERATIONS RESEARCH (Job Oriented Course)
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Course Outcomes (Cos)

C304.1	State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
C304.2	Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
C304.3	Apply and Solve transportation and assignment problem by using Linear programming Simplex method.
C304.4	Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions
C304.5	Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

C306	ARTIFICIAL INTELLIGENCE (Professional Elective –I)
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Course Outcomes (Cos)

C306.1	Understand the fundamental concepts in Artificial Intelligence
C306.2	Analyze the applications of search strategies and problem reductions
C306.3	Apply the mathematical logic concepts.
C306.4	Develop the Knowledge representations in Artificial Intelligence.
C306.5	Explain the Fuzzy logic systems.

C307	DATA WAREHOUSING AND DATA MINING LAB
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Course Outcomes (Cos)

C307.1	Design a data mart or data warehouse for any organization
C307.2	Extract knowledge using data mining techniques and enlist various algorithms used in information analysis of Data Mining Techniques
C307.3	Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification for realistic data
C307.4	Implement and Analyze on knowledge flow application on data sets and Apply the suitable visualization techniques to output analytical results
C307.5	

C308	COMPUTER NETWORKS LAB
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Course Outcomes (Cos)

C308.1	Know how reliable data communication is achieved through data link layer.
C308.2	Suggest appropriate routing algorithm for the network.
C308.3	Provide internet connection to the system and its installation.
C308.4	Work on various network management tools

C309	CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY USING DevOps (Skill Oriented Course)
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Course Outcomes (Cos)

C309.1	Understand the why, what and how of DevOps adoption
C309.2	Attain literacy on Devops
C309.3	Align capabilities required in the team
C309.4	Create an automated CICD pipeline using a stack of tools

C311	MACHINE LEARNING
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Course Outcomes (Cos)

C311.1	Explain the fundamental usage of the concept Machine Learning system
C311.2	Demonstrate on various regression Technique
C311.3	Analyze the Ensemble Learning Methods
C311.4	Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
C311.5	Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

C312	COMPILER DESIGN
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Course Outcomes (Cos)

C312.1	Demonstrate phases in the design of compiler
C312.2	Organize Syntax Analysis, Top Down and LL(1) grammars
C312.3	Design Bottom Up Parsing and Construction of LR parsers
C312.4	Analyze synthesized, inherited attributes and syntax directed translation schemes
C312.5	Determine algorithms to generate code for a target machine

C313	CRYPTOGRAPHY AND NETWORK SECURITY
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Course Outcomes (Cos)

C313.1	Explain different security threats and countermeasures and foundation course of cryptography mathematics
C313.2	Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
C313.3	Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more
C313.4	Design applications of hash algorithms, digital signatures and key management techniques
C313.5	Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL, TSL, and IPsec .

C314	OBJECT ORIENTED ANALYSIS AND DESIGN (Professional Elective II)
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Course Outcomes (Cos)

C314.1	Analyze the nature of complex system and its solutions.
C314.2	Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships
C314.3	Analyze & Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications.
C314.4	Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams.
C314.5	Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems.

C315	MEAN STACK DEVELOPMENT (Job Oriented Course)
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Course Outcomes (Cos)

C315.1	Build static web pages using HTML 5 elements
C315.2	Build static web pages using HTML 5 elements. Apply JavaScript to embed programming interface for web pages and also to perform Client side• validations.
C315.3	Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js
C315.4	Develop JavaScript applications using typescript and work with document database using MongoDB.
C315.5	Utilize Angular JS to design dynamic and responsive web pages.

C316	MACHINE LEARNING USING PYTHON LAB
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Course Outcomes (Cos)

C316.1	Implement procedures for the machine learning algorithms
C316.2	Design and Develop Python programs for various Learning algorithms
C316.3	Apply appropriate data sets to the Machine Learning algorithms
C316.4	Develop Machine Learning algorithms to solve real world problems

C317	COMPILER DESIGN LAB
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Course Outcomes (Cos)

C317.1	Design simple lexical analyzers
C317.2	Determine predictive parsing table for a CFG
C317.3	Apply Lex and Yacc tools
C317.4	Examine LR parser and generating SLR Parsing table
C317.5	Relate Intermediate code generation for subset C language

C318	CRYPTOGRAPHY NETWORK SECURITY LAB
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Course Outcomes (Cos)

C318.1	Apply the knowledge of symmetric cryptography to implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher
C318.2	Demonstrate the different algorithms like DES, BlowFish, and Rijndael, encrypt the text “Hello world” using Blowfish Algorithm.
C318.3	Analyze and implement public key algorithms like RSA, Diffie-Hellman Key Exchange mechanism, the message digest of a text using the SHA-1 algorithm

C319	MEAN STACK TECHNOLOGIES-MODULE I (HTML 5, JAVASCRIPT, EXPRESS.JS, NODE.JS AND TYPESCRIPT) (Skill Oriented Course)
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Course Outcomes (Cos)

C319.1	Develop professional web pages of an application using HTML elements like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles.
C319.2	Utilize JavaScript for developing interactive HTML web pages and validate form data.
C319.3	Build a basic web server using Node.js and also working with Node Package Manager (NPM).
C319.4	Build a web server using Express.js
C319.5	Make use of Typescript to optimize JavaScript code by using the concept of strict type checking.

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FOURTH YEAR COURSES (I & II SEMISTER)
Course Outcome's (Co's)
IV-I & IV-II

C401	CLOUD COMPUTING (Professional Elective-III)
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Course Outcomes (Cos)

C401.1	Illustrate the key dimensions of the challenge of Cloud Computing
C401.2	Classify the Levels of Virtualization and mechanism of tools.
C401.3	Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
C401.4	Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
C401.5	Assess control storage systems and cloud security, the risks involved its impact and develop cloud application

C402	DEEP LEARNING TECHNIQUES (Professional Elective-IV)
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Course Outcomes (Cos)

C402.1	Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning.
C402.2	Discuss the Neural Network training, various random models.
C402.3	Explain the Techniques of Keras, Tensor Flow, Theano and CNTK
C402.4	Classify the Concepts of CNN and RNN
C402.5	Implement Interactive Applications of Deep Learning

C403	ETHICAL HACKING (Professional Elective-V)
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Course Outcomes (Cos)

C403.1	Explain the concepts related to hacking, ports and protocols, pen testing and virtualization
C403.2	Determine the applicable foot printing techniques and scanning methods
C403.3	Explain the process of system hacking and Explain the concepts Trojans, backdoors, worms and virus and it's countermeasures
C403.4	Demonstrate systematic understanding of the concepts of Sniffing and Social Engineering and it's attacks
C403.5	Determine the applicable methods of cryptography, steganography and Vulnerability Assessment

C404	UNIVERSAL HUMAN VALUES 2
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Course Outcomes (Cos)

C404.1	Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
C404.2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
C404.3	Strengthening of self-reflection
C404.4	Development of commitment and courage to act.

C405	BASIC ELECTRONICS ENGINEERING
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Course Outcomes (Cos)

C405.1	To give knowledge of some basic electronic components and circuits.
C405.2	To introduce basics of diode and transistor circuits
C405.3	To understand working of some I C based circuits
C405.4	To study logic gates and their usage in digital circuits.
C405.5	To introduce basic aspect of electronic communication systems.

C406	ENVIRONMENTAL MANAGEMENT
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Course Outcomes (Cos)

C406.1	understand the environmental, social and economic framework in which environmental management decisions are made
C406.2	understand the life cycle perspective, systems approach and environmental technologies
C406.3	communicate proficiently in writing and speaking for promoting and coordinating public consultations on environmental matters
C406.4	Collaborate with environmental engineers, planners, technicians, and other specialists, and experts in to address environmental problems.
C406.5	recognize, evaluate, and control factors in the workplace and the environment that cause health and environmental hazards

C407	PROJECT WORK
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Course Outcomes (Cos)

C407	On the completion of project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology
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PROGRAMME: COMPUTER SCIENCE AND ENGINEERING (M.TECH)
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FIRST YEAR COURSES (I & II SEMISTER)
Course Outcome's (Co's)
I-I & I-II

C101	MTCSE1101	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
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Course Outcomes (Cos)

C101.1	To apply the basic rules and theorems of probability theory such as Baye's Theorem, to determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.
C101.2	Able to perform and analyze of sampling, means, proportions, variances and estimates the maximum likelihood based on population parameters.
C101.3	To learn how to formulate and test hypotheses about sample means, variances and proportions and to draw conclusions based on the results of statistical tests.
C101.4	Design various ciphers using number theory.
C101.5	Apply graph theory for real time problems like network routing problem.

C102	MTCSE1102	ADVANCED DATA STRUCTURES & ALGORITHMS
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Course Outcomes (Cos)

C102.1	Ability to write and analyze algorithms for algorithm correctness and efficiency
C102.2	Master a variety of advanced abstract data type (ADT) and data structures and their Implementation
C102.3	Demonstrate various searching, sorting and hash techniques and be able to apply and solve problems of real life
C102.4	Design and implement variety of data structures including linked lists, binary trees, heaps, graphs and search trees
C102.5	Ability to compare various search trees and find solutions for IT related problems

C103	MTCSE1103	BIG DATA ANALYTICS
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Course Outcomes (Cos)

C103.1	Illustrate on big data and its use cases from selected business domains.
C103.2	Interpret and summarize on No SQL, Cassandra
C103.3	Analyze the HADOOP and Map Reduce technologies associated with big data analytics and explore on Big Data applications Using Hive.
C103.4	Make use of Apache Spark, RDDs etc. to work with datasets.
C103.5	Assess real time processing with Spark Streaming.

C104	MTCSE1104	INTERNET OF THINGS
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Course Outcomes (Cos)

C104.1	Summarize on the term 'internet of things' in different contexts.
C104.2	Analyze various protocols for IoT.
C104.3	Design a PoC of an IoT system using Rasperry Pi/Arduino
C104.4	Apply data analytics and use cloud offerings related to IoT.
C104.5	Analyze applications of IoT in real time scenario

C105	MTCSE1105	RESEARCH METHODOLOGY AND IPR
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Course Outcomes (Cos)

C105.1	Assemble and disassemble components of a PC
C105.2	Construct a fully functional virtual machine, Summarize various Linux operating system commands.
C105.3	Recognize characters & extract text from scanned images, Create audio files and podcasts.

C106	MTCSE1106	ADVANCED DATA STRUCTURES & ALGORITHMS LAB
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Course Outcomes (Cos)

C106.1	Identify classes, objects, members of a class and relationships among them needed for a specific problem.
C106.2	Examine algorithms performance using Prior analysis and asymptotic notations.
C106.3	Organize and apply to solve the complex problems using advanced data structures (like arrays, stacks, queues, linked lists, graphs and trees.
C106.4	Apply and analyze functions of Dictionary

C107	MTCSE1107	ADVANCED COMPUTING LAB
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Course Outcomes (Cos)

C107.1	The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.
C107.2	Development and use of s IoT technology in Societal and Industrial Applications.
C107.3	Skills to undertake high quality academic and industrial research in Sensors and IoT.
C107.4	To classify Real World IoT Design Constraints, Industrial Automation in IoT.

C108	MTCSE1201	MACHINE LEARNING
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Course Outcomes (Cos)

C108.1	Domain Knowledge for Productive use of Machine Learning and Diversity of Data.
C108.2	Demonstrate on Supervised and Computational Learning
C108.3	Analyze on Statistics in learning techniques and Logistic Regression
C108.4	Illustrate on Support Vector Machines and Perceptron Algorithm
C108.5	Design a Multilayer Perceptron Networks and classification of decision tree

C109	MTCSE1202	MEAN STACK TECHNOLOGIES
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Course Outcomes (Cos)

C109.1	After the completion of the course, student will be able to
C109.2	Identify the Basic Concepts of Web& Markup Languages.
C109.3	Develop web Applications using Scripting Languages & Frameworks.
C109.4	Make use of Express JS and Node JS frameworks
C109.5	Adapt to Deployment Techniques & Working with cloud platform.

C110	MTCSE1203	ADVANCED DATABASES AND MINING
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Course Outcomes (Cos)

C110.1	Analyze on normalization techniques.
C110.2	Elaborate on concurrency control techniques and query optimization.
C110.3	Summarize the concepts of data mining, data warehousing and data preprocessing strategies.
C110.4	Apply data mining algorithms.
C110.5	Assess various classification & cluster techniques.

C111	MTCSE1204	CLOUD COMPUTING
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Course Outcomes (Cos)

C111.1	Interpret the key dimensions of the challenge of Cloud Computing.
C111.2	Examine the economics, financial, and technological implications for selecting cloud computing for own organization
C111.3	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
C111.4	Evaluate own organizations' needs for capacity building and training in cloud computing-related IT areas.
C111.5	To Illustrate Virtualization for Data-Center Automation.

C112	MTCSE1205	MACHINE LEARNING WITH PYTHON LAB
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Course Outcomes (Cos)

C112.1	Implement procedures for the machine learning algorithms
C112.2	Design Python programs for various Learning algorithms
C112.3	Apply appropriate data sets to the Machine Learning algorithms
C112.4	Identify and apply Machine Learning algorithms to solve real world problems

C113	MTCSE1206	MEAN STACK TECHNOLOGIES LAB
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Course Outcomes (Cos)

C113.1	Identify the Basic Concepts of Web & Markup Languages.
C113.2	Develop web Applications using Scripting Languages & Frameworks.
C113.3	Creating & Running Applications using JSP libraries.
C113.4	Working with the Files in React JS and Constructing Elements with Data.

PROGRAMME: COMPUTER SCIENCE AND ENGINEERING (M.TECH)
JNTUK UNIVERSITY REGULATION R20
SECOND YEAR COURSES (I SEMESTER & II SEMESTER)
Course Outcome's (Co's)
II-I & II-II

C201	MTCSE2101	DEEP LEARNING
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Course Outcomes (Cos)

C201.1	Demonstrate the basic concepts fundamental learning techniques and layers.
C201.2	Discuss the Neural Network training, various random models.
C201.3	Explain different types of deep learning network models.
C201.4	Classify the Probabilistic Neural Networks.
C201.5	Implement tools on Deep Learning techniques.

C202	MTECE2102	WASTE TO ENERGY
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Course Outcomes (Cos)

C202.1	Become aware of global energy scenarios
C202.2	Understand actions that can be applied in the context of environmental protection and sustainability
C202.3	Develop skills on main principles of chemical and biotechnological waste-to energy processes
C202.4	Understand the advantages of waste-to-energy conversion and their difficulties to be implemented
C202.5	Known and apply tools for the techno-economic analysis of the studied processes

C203	PROJECT WORK
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Course Outcomes (Cos)

C203	On the completion of project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology
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