SIR C.R.REDDY COLLEGE OF ENGINEERING
ELURU-534007, WEST GODAVARI DIST, A P., INDIA
(Approved by AICTE, New Delhi)
Phone no: 08812-230840, 2300656 Fax: 08812-224193
Visit us at http://www.sircrrengg.ac.in
DEPARTMENT OF INFORMATION TECHNOLOGY

R20 COURSE OUTCOMES

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

COURSES	CO CODE	COURSE OUTCOME DESCRIPTION
Communicative English	C111.1	Apply the four languages learning skills-listening, speaking, reading, writing (LSRW) for professional success.
	C111.2	Employ knowledge of grammatical structures and vocabulary in speech and writing.
	C111.3	Apply effective communication skills to enhance professional possibilities.
	C111.4	Develop acceptable personality traits suitable for chosen profession.
Mathematics-I (Calculus and Differential Equations)	C112.1	Examine the convergence of series and apply mean value theorem to real life problem.
	C112.2	Solve the Differential Equations of first and higher order related to various engineering applications.
	C112.3	Apply the partial differentiation technique to solve physical problem.
	C112.4	Apply double and triple integrals to find areas and volumes.
Applied Physics	C113.1	Apply the knowledge of different optical phenomena in daily life.
	C113.2	Distinguish between laser sources and conventional sources and study the propagation of light through optical fibres.
	C113.3	Explain fundamental concepts of quantum mechanics and analyse the behaviour of electron in metals according to various theories.
	C113.4	Summarize magnetic & dielectric material properties and recognize their need in engineering applications.
	C113.5	Understand electrons& holes behaviour in semiconductors and extraordinary behaviour of materials at various transition temperatures.

Programming for Problem Solving using C	**C114.1**	Understand the fundamental concepts of computers and C language constructs.
	C114.2	Apply the concepts of C constructs Homogeneous and heterogeneous data types and pointers for solving the given problems.
	C114.3	Able to divide a given problem into modules using c constructs and functions to develop modular reusable code.
	C114.4	Analyse the problem, choose appropriate C constructs and use the file system to solve mathematical and engineering problems.
Computer Engineering Workshop	**C115.1**	Understand the basic fundamentals of computer peripherals, storage, networking devices and Internet of Things.
	C115.2	To impact the knowledge and usage of various productivity tools such as Power Point, Word, Excel and Latex.
	C115.3	Develop presentation, documents and small applications using productivity tools such as word processor, presentation tools, spread sheets, HTML & Latex.
	C115.4	Build applications using productivity tools, HTML & LATEX.
English Communication Skills Laboratory	**C116.1**	Recognize the sounds of English with the help of audio visual aids.
	C116.2	Build confidence and overcome inhibitions while speaking in English.
	C116.3	Demonstrate acquired language skills in performing the designated activity.
Applied Physics Lab	**C117.1**	Apply the knowledge of different phenomena of light like interference, diffraction and handle various optical measuring instruments.
	C117.2	Analyse various electronic circuits and study the temperature dependence of semiconductors.
	C117.3	Apply the knowledge of phenomena like LASER diffraction and measure the numerical aperture of an optical fiber.
Programming for Problem Solving using C Lab	**C118.1**	Understand the concepts of C language.
	C118.2	Apply the C language constructions for simple problems.
	C118.3	Apply C constructs like homogenous, heterogeneous data for a given mathematical problem.
	C118.4	Analysis a given scenario using functions & file concepts.
Mathematics – II (Linear Algebra And Numerical Methods)	**C121.1**	Solve system of linear algebraic equations and apply Eigen value computation techniques to reduce a given quadratic to canonical form.
	C121.2	Solve algebraic and Transcendental equations by using Numerical methods.
	C121.3	Apply Newton's forward and backward interpolation and Lagrange's formula for equal and unequal intervals.
	C121.4	Compute numerical solutions of differential equations.
Applied Chemistry	**C122.1**	Identify the advantages and limitations of Plastic materials, Elastomers and their use in day to day life.
	C122.2	Select the suitable methods of corrosion control and gain the knowledge of applications of batteries.
	C122.3	Recognize the need of Nano materials, liquid crystals, semiconductors and super conductors.

	C122.4	Gain the knowledge of applications of different analytical instruments and generation of electricity from various Non-Conventional energy sources.
Computer Organization	**C123.1**	Understand the logical design and functional architecture of computing systems.
	C123.2	Understand the logical design and functional architecture of computing systems.
	C123.3	Identify, compare and assess issues related to bus, memory, Control and I/O functions.
	C123.4	Design solutions in the area of computer architecture and logic designing.
Python Programming	**C124.1**	Understand the fundamental concept and syntax of python programming language.
	C124.2	Apply the basics of programming in the Python language.
	C124.3	Analyze the coding tasks related conditional statements, functions, sequences, file handling, Exception handling.
	C124.4	Create the python programs using object-oriented concept and GUI.
Data Structures	**C125.1**	Understand basic concepts of sorting, searching, linear and non-linear data Structures and algorithms.
	C125.2	Apply the different linear and non-linear data structures, sorting and searching algorithms to various computing problems.
	C125.3	Analyze the performance of various data structures, sorting and searching algorithms.
	C125.4	Evaluate the linear and no linear data structures in a given application
Applied Chemistry Lab	**C126.1**	Obtain the knowledge of acid-base titrations to determine the strength of acid and base solutions.
	C126.2	Gain the knowledge of Redox titrations to determine the concentration of samples such as Ores, KMnO4 and Copper using different indicators.
	C126.3	Obtain the knowledge of complexometry titrations to determine the hardness of given water sample by EDTA method.
Python Programming Lab	**C127.1**	Gain the knowledge of commonly used instruments such as pH meter, Conductivity meter and Potentiometer to determine the strength of given acid solutions.
	C127.2	Understand the need for learning basic concepts of Python programming language.
	C127.3	Apply various data structures in developing solutions to real time scenarios.
	C127.4	Analyze various concepts of functions; make use of packages, object oriented concepts in python programming and Outline Exception handling concepts.
Data Structures Lab	**C128.1**	Design the usage of pattern matching, GUI in python programming.
	C128.2	Understand basic data structures such as arrays, linked lists stacks and queues.
	C128.3	Design programs using a variety of data structures such as stacks, queues, linked lists, binary trees, search trees, heaps and graphs.
	C128.4	Implement ADTs such as lists, graphs, and search trees in C to solve problems.
Mathematics –	**C211.1**	Apply the concepts of vector calculus to the problems of work done by a force, circulation and flux.

III	C211.2	Apply Laplace transforms to solve linear differential equations with constant coefficients.
	C211.3	Compute Fourier series of the periodic functions and apply Fourier transform to a range of non-periodic functions.
	C211.4	Solve the first and higher order Partial differential equations and apply to various engineering problems.
Object Oriented Programming through C++	C212.1	Understand the concepts of object-oriented programming and basic structure of C++ programming.
	C212.2	Apply the concepts of OOP.
	C212.3	Apply C++ programs with reusability concept.
	C212.4	Apply the concepts of Exceptions Handling, templates & amp; STL.
Operating Systems	C213.1	Understand OS evaluation, its structure and services, process concepts, deadlocks concepts, virtual memory, memory management strategies, process synchronization, threads, file systems, system protection & security.
	C213.2	Apply process scheduling policies, mechanisms, process synchronization, inter process communications, threads scheduling, disk scheduling, file concepts, deadlocks concepts, page replacement algorithms, paging and segmentation techniques in memory management.
	C213.3	Analyze various CPU scheduling, disk scheduling, dead lock, memory allocation, replacement algorithms, IPC Communications, file concepts, threads concepts.
	C213.4	Evaluate process scheduling, replacement algorithms; file system and implementation issues, disk scheduling, UNIX/LINUX/WINDOWS OS platforms and other process subsystem related concepts.
Database Management Systems	C214.1	Understand the basic concepts of Data Base, Relational Model, Transaction Management and Concurrency Control, Crash Recovery, Filing and Indexing Techniques.
	C214.2	Apply ER Model for designing Conceptual Data Base and Relational Model for designing Logical Data Base.
	C214.3	Analyze the concepts of Relational Model, Schema Refinement and Normalization.
	C214.4	Design Data Base applications using SQL Queries.
Discrete Mathematics and Graph Theory	C215.1	Understand the fundamentals and various algorithms, theorems, Graphs of DM&GT.
	C215.2	Apply various algorithms, theorems, Graphs to solve problems in DM&GT.
	C215.3	Analyze various problems using different discrete mathematical concepts.
	C215.4	Evaluate various conditions/Statements/problems using the concepts in DM&GT
Object Oriented Programming through C++ Lab	C216.1	Understand the object oriented concepts with language environment.
	C216.2	Implement Object Oriented Programming Concepts in C++.
	C216.3	Implement Object Oriented Programs using templates and exceptional handling concepts.
	C216.4	Analyze the given problem and use appropriate STL algorithm to solve given problem.
Operating Systems Lab	C217.1	Understand the fundamentals of UNIX commands and System calls.
	C217.2	Apply the synchronization concepts using shared memory, semaphores for the given problem.

	C217.3	Apply deadlock avoidance and detection algorithms and various concepts of file systems.
	C217.4	Analyze various thread concepts, CPU scheduling algorithms, and memory management concepts.
Database Management Systems Lab	C218.1	Utilize SQL to execute queries for creating database and performing data manipulation operations.
	C218.2	Examine integrity constraints to build efficient databases.
	C218.3	Apply Queries using Advanced Concepts of SQL.
	C218.4	Build PL/SQL programs including stored procedures, functions, cursors and triggers.
Skill oriented Course-I Distributed Technologies-No SQL	C219.1	Understand about SQLite3, its features and environment setting.
	C219.2	Apply SQLite fundamental commands for various queries.
	C219.3	Apply SQL commands in SQLite environment for data definition and manipulation.
	C219.4	Analyze the complex database functions like Aggregate, Core functions, JOINS and Triggers.
Statistics with R	C221.1	Understand the R programming concepts required for statistics.
	C221.2	Apply basic Math and statistics in R programming.
	C221.3	Analyze the R programming constructs/models required to perform certain statistics.
	C221.4	Apply visualizations/graphics in R Programming.
Principles of Software Engineering	C222.1	Understand basic concepts of software engineering, phases of software development in common process models, unified and agile process models.
	C222.2	Apply various engineering practices such as requirements analysis and specification, modelling, code analysis, testing, and quality assurance strategies for developing software.
	C222.3	Analyze the gathered requirements for creating various requirement models.
	C222.4	Prepare the architectural design, components level design, interface design and acquire skills to design and implement test cases at the Unit and Integration level.
Automata Theory and Compiler Design	C223.1	Understand the language processors, finite Automata and compiler design phases.
	C223.2	Apply various finite Automata techniques and compiler design techniques for a given problem.
	C223.3	Analyse various compiler design techniques for given grammar.
	C223.4	Evaluate various compiler phases for the given grammars.
Java Programming	C224.1	Understand the java programming constructs, control Structures, classes, objects, methods, arrays, inheritance, interfaces, packages, exception handling, string handling, multi-threaded programming and data base connectivity.
	C224.2	Apply the java programming constructs, control structures, classes, objects, methods, arrays, inheritance, interfaces, packages, exception handling, string handling, multi-threaded programming and data base connectivity for a given scenario.
	C224.3	Analyse the java programming constructs, control structures, arrays, inheritance, interfaces, exception handling, string handling and multi-threaded programming.
	C224.4	Recommend the best suitable java construct/concept for a given application/problem.

Managerial Economics and Financial Accountancy	**C225.1**	Understand the fundamental concepts of managerial economics, production & cost analysis, markets & pricing strategies, accounting & financing analysis and capital budgeting.
	C225.2	Apply production cost analysis, capital budgeting, financial analysis techniques in evaluating various investment opportunities.
	C225.3	Analyse the various aspects of managerial economics, production & cost analysis, markets & pricing strategies, accounting & financing analysis and capital budgeting.
	C225.4	Evaluate the performance evaluation of production cost analysis, financial statements and investment project proposals with the help of accounting tools and capital budgeting techniques.
UML Lab	**C226.1**	Understand the modelling tools like IBM Rational Rose/Star UML.
	C226.2	Analyze the requirements and create use case scenarios of an application.
	C226.3	Develop use case, class, activity, sequence, state, component and deployment Diagrams.
	C226.4	Design simple applications and models.
FOSS Lab	**C227.1**	Understand UNIX commands for file handling and System calls.
	C227.2	Apply Regular expressions for pattern matching to various filters for a specific task.
	C227.3	Apply shell script to solve complex problems.
	C227.4	Analyse a given problem in order to devise a shell script to solve.
Java Programming Lab	**C228.1**	Evaluate default value of all primitive data type, Operations, Expressions, Control flow, Strings
	C228.2	Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism.
	C228.3	Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism.
	C228.4	Construct Threads, Event Handling, implement packages, developing applets.
Skill oriented Course - II Distributed Technologies-MongoDB	**C229.1**	Install, configure and setup the drivers to use MongoDB.
	C229.2	Gain an in-depth understanding of main features of MongoDB and their use cases.
	C229.3	Retrieve data in the database using MongoDB querying.
	C229.4	Apply the advanced MongoDB Querying to retrieve the data from the collection.
Computer Networks	**C311.1**	Understand the concepts and functionalities of various layers of OSI reference, TCP/IP Models, Internet working, different transmission media and switching network.
	C311.2	Apply the concepts of Data link Layer, Network layer and application layer.
	C311.3	Analyze the concepts of various layers of OSI, TCP/IP Models, internet working, functions and protocols like HDLC, and PPP.
	C311.4	Compare and classify medium access control protocols like ALOHA,CSMA,CSMA/CD,CSMA/CA, polling, token passing, FDMA,TDMA,CDMA PROTOCOLS.

Design and Analysis of Algorithms	**C312.1**	Understand various algorithms approaches to solve engineering problems, asymptotic notation for denoting time complexities of recursive and non-recursive algorithms and theory of NP-completeness.
	C312.2	Apply various techniques like divide and conquer, greedy technique to solve in common engineering design situations.
	C312.3	Apply various algorithm design paradigms like dynamic programming, backtracking to solve problems
	C312.4	Analyze the performance of given algorithm and determine its space and time complexity.
Data Mining Techniques	**C313.1**	Describe the concepts and functionalities of Data Warehousing and various Data Mining Techniques.
	C313.2	Apply appropriate techniques to convert raw data into suitable format for practical data mining tasks.
	C313.3	Analyze and compare various classification algorithms and apply in appropriate domain.
	C313.4	Identify the kinds of frequent patterns that can be discovered for association rule mining in databases using different techniques.
	C313.5	Cluster the data for better organization and discover the knowledge imbibed in the high dimensional system.
Open Elective – I : DevOps (Job Oriented course)	**C314.1**	Understand the various phases of SDLC and agile software development.
	C314.2	Understand the fundamentals of DevOps ,adoption in projects ,CI/CD and DevOps maturity models.
	C314.3	Use the DevOps Tool stack in software development process.
	C314.4	Analyse various aspects in DevOps like DevOps adoption, CI/CD practices and DevOps Maturity models.
Professional Elective – I : Artificial Intelligence	**C315.1**	Understand Fundamental concepts of Artificial Intelligence.
	C315.2	Apply various logic concepts and search strategies in representing knowledge for various problems.
	C315.3	Analyze the applications of search strategies and problem reductions.
	C315.4	Evaluate the knowledge representations in Artificial Intelligence and fuzzy logic systems.
Data Mining Techniques with R Lab	**C316.1**	Understand the functionality of R by using add-on packages.
	C316.2	Apply various statistical functions and examine data from files and other sources and perform various data manipulation tasks on them.
	C316.3	Apply preprocessing techniques and mining methods to extract knowledge using R Graphics and Tables to visualize the results.
	C316.4	Analyze the data for real life applications.
Computer Networks Lab	**C317.1**	Study the Network devices, physical layer, data link layer and network layer algorithms.
	C317.2	Implement the various computer networks algorithms in any programming language.
	C317.3	Implement the packet capture, captured traffic and perform analysis using Wireshark.
	C317.4	Study and detect the operating system using Nmap.
	C317.5	Find the number of packets dropped in various scenarios using NS2/NS3 Simulator.
Skill Oriented	**C318.1**	Understand various tools of digital 2-D animation.

Course – III : Animation course : Animation Design	**C318.2**	Apply different styles and treatment of content in 2D animation .
	C318.3	Apply tools to create effective 3D modeling texturing and lighting.
	C318.4	Analyze video processing in applications.
Summer Internship	**C319.1**	Understand various interest groups, disciplines, professionals, managers, technicians etc.
	C319.2	Apply the knowledge in day-to-day operations, trouble-shooting and minor-modifications.
	C319.3	Build relations between University and Industry that will help mutual cooperation over long-term.
	C319.4	Develop/strengthen the basic skills of interviewing, analysis, report writing, communication, decision-making, and problem solving
Machine Learning	**C321.1**	Understand the fundamental usage of the Machine Learning System concepts.
	C321.2	Demonstrate on various Regression Techniques.
	C321.3	Analyze the Ensemble Learning Methods.
	C321.4	Apply Supervised Learning Techniques, Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
	C321.5	Discuss the Neural Network Models and Fundamentals concepts of Deep Learning.
Big Data Analytics	**C322.1**	Understand various Big Data techniques in the real world.
	C322.2	Apply various Big Data Analytics techniques for mining stream, Hadoop concepts, pig, Hive and predictive analysis.
	C322.3	Analyze Big Data Analytics techniques for given Scenario.
	C322.4	Choose appropriate various Big Data Analytics techniques for given problem.
Cryptography and Network Security	**C323.1**	Understand various cryptographic techniques and network security algorithms.
	C323.2	Apply various cryptographic techniques and network security algorithms for given scenario.
	C323.3	Analyze various cryptographic techniques and network security algorithms for a given network applications.
	C323.4	Evaluate various cryptographic techniques and network security algorithms for a given network applications.
Professional Elective-II : MEAN Stack Development	**C324.1**	Build static web pages using basic and advanced concepts of HTML 5.
	C324.2	Construct Dynamic web application using the Java script programming concepts such as variables, arrays, conditionals, and loops to solve practical web design problems.
	C324.3	Build a basic web server using Node.js and work with Node Package Manager (NPM) and recognize the need for Express.js.
	C324.4	Develop JavaScript applications using typescript and work with document database using MongoDB .
	C324.5	Develop dynamic and responsive web pages with Angular JS.
Open Elective –II	**C325.1**	Understand various microprocessors, their architectures, families, assembly language programming concepts, interfacing

: FMMC		with other peripheral interfacing chips.
	C325.2	Understand various microcontrollers, memory organization, their architectures, families, programming concepts, interfacing, control algorithms.
	C325.3	Demonstrate various programming techniques of microprocessors and microcontrollers and interface programming with peripherals.
	C325.4	Analyze the performance of microprocessors, microcontrollers, interfacing techniques in designing processor/controller based systems.
Big Data Analytics Lab	C326.1	Understand the basics of data structures like Linked list, stack, queue, set, map in Java and installation of Hadoop, Pig, Hive.
	C326.2	Demonstrate the knowledge of big data analytics in different file management task in Hadoop.
	C326.3	Implement Map Reduce programs in variety applications.
	C326.4	Apply different operations on relations and databases using Hive.
	C326.5	Analyze and perform different operations on data using Pig Latin scripts.
Machine Learning using Python Lab	C327.1	Implement procedures for the machine learning algorithms.
	C327.2	Design and Develop Python programs for various Learning algorithms.
	C327.3	Apply appropriate data sets to the Machine Learning algorithms.
	C327.4	Develop Machine Learning algorithms to solve real world problems.
Cryptography and Network Security Lab	C328.1	Understand the various cryptographic techniques like symmetric key, asymmetric key and hash functions.
	C328.2	Applying the various cryptographic techniques like symmetric key, asymmetric key and hash functions.
	C328.3	Analyze the various cryptographic techniques like symmetric key and asymmetric key algorithms.
	C328.4	Analyze the various hash functions and digital signatures.
Skill Oriented Course-IV:Video Analytics	C329.1	Discuss the principles and techniques of digital image and the fundamentals of digital video processing
	C329.2	Apply the image recognition and motion recognition in videos.
	C329.3	Apply the motion estimation, segmentation and modeling concepts in video applications.
	C329.4	Analyze video processing in applications.
Cloud Computing	C411.1	Understand fundamental aspects of Cloud Computing such as: Cloud Models, Services Challenges, Clustering and Virtualization.
	C411.2	Annotate the importance of virtualization of Clusters and Data Centers, Cloud architectures, Applications& Paradigms, Resource management and Scheduling in Cloud Computing, Storage file system and their security mechanisms.
	C411.3	Employ programming skills in various real time clouds like Microsoft Azure, Amazon AWS etc, virtualization tools and mechanisms in cloud automation, various algorithms of resource management and scheduling, Storage models and Parallel file systems.
	C411.4	Identify issues pertaining to performance, storage, virtualization, resource management, scheduling, security risks in cloud

		computing implementation and corresponding solutions.
Deep Learning Techniques	**C412.1**	Demonstrate the fundamental concepts, learning techniques of Artificial Intelligence, Machine Learning & Deep Learning
	C412.2	Illustrate the Neural Network training, various random models, techniques of Keras, Tenserflow, Theano & CNTK
	C412.3	Implement interactive applications of Deep Learning
	C412.4	Classify the concepts of CNN & RNN
Ethical Hacking	**C413.1**	Understand the concepts of Ethical hacking like Footprinting, System Hacking, Sniffing, and packet Analysis & Session Hijacking and cryptography.
	C413.2	Demonstrate the concepts of Ethical hacking like Footprinting, System Hacking, Sniffing, and packet Analysis & Session Hijacking cryptography.
	C413.3	Analyze the concepts of Ethical hacking like Footprinting, System Hacking, Sniffing, and packet Analysis & Session Hijacking cryptography.
	C413.4	Evaluate the concepts of Ethical hacking like Footprinting, System Hacking ,Sniffing, Packet Analysis & Session Hijacking cryptography for given scenario.
Concepts of Internet of Things	**C414.1**	Summarize Internet of Things (IoT)
	C414.2	Demonstrate various business models relevant to IoT.
	C414.3	Construct designs for web connectivity
	C414.4	Organize sources of data acquisition related to IoT, integrate to enterprise systems and cloud technologies.
Soft Computing Techniques	**C415.1**	Develop intelligent systems leveraging the paradigm of soft Computing techniques.
	C415.2	Implement, evaluate and compare solutions by various soft Computing approaches for finding the optimal solutions.
	C415.3	Recognize the feasibility of applying a soft Computing methodology for a particular problem.
	C415.4	Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks.
	C415.5	Design hybrid system to revise the principles of soft Computing in various application.
Universal Human Values	**C416.1**	Understand the essentials of human values and skills, self-exploration, happiness and prosperity
	C416.2	Apply the role of a human being in ensuring harmony in self and family
	C416.3	Interpret the role of a human being in ensuring harmony in society and nature
	C416.4	Distinguish between ethical and unethical practices and start working out the strategy to actualize a harmonious environment wherever they work
PYTHON: Deep Learning Lab	**C417.1**	Demonstrate the basic concepts fundamental learning techniques and layers
	C417.2	Discuss the neural network training, various random models
	C417.3	Apply various optimization algorithms to comprehend different activation functions to understand hyper parameter tuning.
	C417.4	Build a convolution neural network, and understand its applications to build a recurrent neural network ,and understand its usage to comprehend auto encoders to briefly explain transfer learning.

Industrial/Research Internship	**C418.1**	Explain the concept, meaning and features of entrepreneursh
	C418.2	Infer the entrepreneual environment & Policies of central and state government
	C418.3	Interpret the business plan preparation from sources to evaluation
	C418.4	Analyze the entrepreneurship as a career option
	C418.5	Discuss the management of small business in all aspects.
Project	**C421.1**	Understand software engineering process models to solve complex problems.
	C421.2	Gather and document the requirements of the real world problems.
	C421.3	Design architecture of the application and develop the data store layout by utilising modern tools.
	C421.4	Develop solutions using programming languages.
	C421.5	Develop the team work and leadership skills with professional and ethical values.

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