NARAYANA ENGINEERING COLLEGE:: NELLORE

DEPARTMENT OF CSE

COURSE OUTCOMES and PO Mapping-R21 -B.Tech

S.No.	SUBJECT NAME	SUBJECT CODE	COURSE CODE	CO - NUMBER	COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
(1-1) CO-PO Mapping																			
1	Algebra and Calculus	21MA1001	C111	C111.1	Make use the concepts of Matrices to solve various Engineering problems .(BL-3)	3	3											1	
				C111.2	Solve the First order differential equations arising in various engineering fields .(BL-3)	3	3												
				C111.3	Identify different types of higher order differential equations and their applications in solving engineering problems . (BL-3)	3	3											1	
				C111.4	Apply Mean value theorems, Multi variable calculus to solve engineering problems (BL-3)	3	3											1	
				C111.5	Identify solution methods for partial differential equations that model physical processes (BL-3)	3	3												
				C111.6	Apply multiple integrals techniques to solve engineering problems (BL-3)	3	3												
						3.00	**3.00**											**1.00**	
2	Chemistry	21CH1001	C112	C112.1	Illustrate the molecular orbital energy level diagram of different molecular species. (BL-2)	3													
				C112.2	Make use the knowledge about various kinds of electro chemical cells in engineering applications. (BL-2)	3	2				2	2							
				C112.3	Interpret the various energy storage devices and emerging technologies in engineering applications. (BL-2)	3					2	2							
				C112.4	Understand the mechanism and applications of different polymers in electronic devices. (BL-2)	3					2	2							
				C112.5	Familiarize the various sources of renewable energy and their harnessing. (BL-2)	3	2					2							
				C112.6	Apply the spectroscopy methods for the analysis of engineering materials. (BL-3)	3	2				2								
						3.00	**2.00**				**2.00**	**2.00**							
3	problem Solving and Programming	21ES1001	C113	C113.1	Understand the peripherals, ports and connecting cables and able to assemble the system. [BL -2]	3	3	2	1									3	1
				C113.2	Apply algorithmic approach to solve computational problems. [BL -3]	3	3											1	1
				C113.3	Apply modular approach for solving the problems by using the control structures. [BL-3]	3	3	3										3	
				C113.4	Select the individual data elements to simplify solutions and provide efficient memory utilization. [BL-3]	3	3	3										3	2
				C113.5	Develop sorting algorithms for heterogeneous data. *[BL-3]*	3	3	2										1	2
				C113.6	Explain User-Defined Data Types and Files. (BL - 2)	3	3	1										3	2
						3.00	**3.00**	**2.20**	**1.00**									**2.33**	**1.60**
4	English	21EN1001	C114	C114.1	Practice the formulating appropriate sentences with Grammatical accuracy and also develop concept of word formation. .(BL3)										3				
				C114.2	Describe coherent and unified paragraphs with adequate support and detail and can write a topic sentence, support and concluding sentence. (BL2)									2	3				
				C114.3	Employ the writing and life skills in structural manner of real time scenarios. (BL-2)										3				
				C114.4	Explain the grammar rules for synthesis of sentences and use prewriting strategies to plan to write dialogues, reviews and edit the text effectively. (BL - 2)									2	3				
				C114.5	Interpret the skills and sub skills of reading and use strategies for reading effectively and provide knowledge on the structure									3	3				
				C114.6	Use the concepts of various real time scenarios to represent in an effective model. (BL - 3)									3	3				
														2.50	**3.00**				

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5	Chemistry Lab	21CH1501	C115	C115.1	Demonstrate the cell constant and conductance of solutions (BL2)	3	2				2								
				C115.2	Interpret the strength of an acid present in secondary batteries (BL2)	3	2				2								
				C115.3	Demonstrate advanced polymer materials are used in engineering applications (BL2)	3	2				2								
				C115.4															
						3.00	2.00				2.00								
6	Engineering Graphics Lab	21ES1503	C116	C116.1	Develop the orthographic projection of points and straight lines(BL-3)	2	2			1							2		
				C116.2	Construct the planes and simple solids.(BL-3).	2	2			2	1						2		
				C116.3	Understand and practice basic AUTOCAD commands (BL-2)	1	1	1		1							1		
				C116.4	Construct Isometric views using AUTOCAD (BL-3)	2	2	2		2							1		
						1.75	1.75	1.50		1.50	1.00						1.50		
7	Problem Solving and Programming lab	21ES1501	C117	C117.1	Translate algorithms into programs (In C language) (BL - 2)	3	3	3										3	
				C117.2	Solve the problems and implement algorithms in C. (BL - 3)	3	3	3										3	
				C117.3	Make use of different data types to handle the real time data (BL - 3)	3	2	3	3									3	
				C117.4															
						3.00	2.67	3.00	3.00									3.00	
8	English Language Lab	21EN1501	C118	C118.1	Understand how speech sounds are used to create meaning. Apply their knowledge of English phonetics and phonology to									2	3				
				C118.2	Recognize and use pitch patterns to signal complete and incomplete thought groups and Speak confidently and									3	2				
				C118.3	Discuss and respond to content of a lecture or listening passage orally and/or in									3	3				
				C118.4	writing and make inferences and predictions about spoken discourse									3	2				
														2.75	2.50				

(1-2) CO-PO Mapping

9	Probability and statitics	21MA1002	C121	C121.1	Apply regression analysis to Estimate business and engineering Trend values (L-3)	3	3	1	2										
				C121.2	Apply the probability basic concepts to predict the information about on data(L-3)	3	3		2										
				C121.3	Evaluate expected mean lifetime, failure rates, and service rates	3	3		2										
				C121.4	Test the hypothesis to Interpret the results by using Large sample Tests (L-4)	3	3		3										
				C121.5	Test hypothesis to interpret the results by using small sample Tests(L-4)	3	3												
						3.00	3.00	1.00	2.25										
10	Semiconductor Physics	21PH1004	C122	C122.1	Comprehend the concepts of matter waves, wave functions and its interpretation to understand the matter at atomic scale. (BL-2)	3	2												
				C122.2	Outline Free electron theories on metals. (BL-2)	3	1												
				C122.3	Summarize the concept of physics in semiconductors (BL-2)	3	2												
				C122.4	Demonstrate the physics of semiconductors for electronic devices (BL-2)	3													

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				C122.5	Comprehend the importance of optical properties of materials (BL-2)	3												1	
				C122.6	Realize importance of LASERs and optical fibres in Engineering and Medical applications (BL-2)	3	1				1								
						3.00	1.50				1.00							1.00	
11	Basic Electrical and Electronics Engineering	21ES1004	C123	C123.1	**Summarize** the **basic concepts of R,L,C ,voltage ,current and power** of a circuit **(BL-3)**	3	2											3	
				C123.2	Describe the **principle, working and construction** of DC Generators &Motor **(BL-2)**	3	2											3	
				C123.3	Describe the **construction, operation, types and equivalent circuit** of a single phase transformer. **(BL-2)**	3	3											3	
				C123.4	Explain the operation and characteristics of pn junction diode ,rectifiers . (BL-2)	3	3	2										2	
				C123.5	Explain the working and configuration characteristics of BJT ,FET and MOSFET (BL-2)	3	2	2										1	
				C123.6	Explain the operation Oscillator circuits and Op-amp applications (BL-2)	3	3	2										2	
						3	**2.5**	**2**										**2.3333**	
12	Python Programming and data science	21ES1005	C124	C124.1	Demonstrate various operators, data types and decision structur	3	2		2									1	
				C124.2	Solve problems using Functions and data structures in python. (B	3	3		2									1	
				C124.3	Implement the concept of Files and modules. (BL-3)	3	2	2										2	
				C124.4	Implement Data science queries using NUMPY module. (BL-3)	3	1	1										2	2
				C124.5	Solve data manipulation task using PANDAS module. (BL-3)	3	2	2										2	2
						3	**2**	**1.667**	**2**									**1.6**	**2**
13	Semiconductor physics lab	20PH1504	C125	C125.1	Comprehend the role of lasers in diffraction and the importance of optical fiber parameters	3					1								
				C125.2	Demonstrate the physics of semiconductors for electronic devices	3													
				C125.3	Recognize the importance of energy gap in the study of conductivity and Hall Effect in a semiconductor	3													
				C125.4	Identify the importance of four probe method in determination of resistivity of a given semiconductor	3													
						3					**1**								
14	Basic Electrical and Electronics Engineering lab	20ES1507	C126	C126.1	Verify Kirchoff's Laws & Superposition theorem.	2	3	2										3	3
				C126.2	Understand the performance characteristics of DC and AC Machines	1	2	2										2	3
				C126.3	Describe construction, working and characteristics of diodes, transistors and	2	2		1									2	3
				C126.4	Demonstrate how electronic devices are used for applications such as rectification, switching and amplification(BL-01)	2	2											2	2
						1.75	**2.25**	**2**	**1**									**2.25**	**2.75**
15	Engineering and IT Workshop	20ES1505	C127	C127.1	Understand the safety aspects in using the tools and equipments. (BL-2)	3	2												
				C127.2	Apply basic electrical engineering knowledge to make simple house wiring circuits and check their functionality.(BL-3)	3	2												
				C127.3	Understand to disassemble and assemble a Personal Computer and prepare the computer ready to use (BL-2)	3	2		1										
				C127.4	Apply knowledge to interconnect two or more computers for information sharing (BL-3)	2	2												
						2.75	**2**		**1**										
	Python Programming			C128.1	Understanding and use of python- Basic Concepts (BL -2)	3	2	3										3	

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16	Programming and data science lab Lab	21ES1508	C128	C128.2	Solve the Problems using python iterative statement (BL -3)	3	2	3										1	
				C128.3	Understand the concepts of files, modules (BL -2)	2	2	3	3									1	2
						2.66667	**2**	**3**	**3**									**1.6667**	**2**
17	Oral Communication Skills Lab	21EN1502	C129	C129.1	To develop knowledge, skills, and judgment around human communication									2	3				
				C129.2	that facilitates their ability to work collaboratively with others.									3	2				
				C129.3	Use listening skills to create more effective, less confrontational, more									2	3				
				C129.4	productive professional & personal relationships and understand techniques required for excellent telephone									3	3				
														2.5	**2.75**				

					(2-1) CO-PO Mapping														
	Universal human values	**21EN1002**	**C211**	C211.1	Development of a holistic perspective based on self								**4**						**2**
				C211.2	Understanding of the harmony in the self,family and								**3**						**2**
				C211.3	**stregthening of the self reflection**						**4**								**2**
				C211.4	**Development of commitment and courage**							**4**							**1**
				C211.5	**Understanding the harmony of professional ethics**						**2**		**3**						**1**
18	Data Structures and Algorithms	21ES1009	C212	C212.1	Analyze the searching algorithms to evaluate the time & space complexities.(BL-4)	3	2	2										2	
				C212.2	Apply the knowledge of stack and queues for various applications. (BL - 3)	1	3	3										2	
				C212.3	Apply the knowledge of linked lists and sorting techniques for various applications. (BL - 3)	1	3	3	1									2	
				C212.4	Apply the knowledge of tree concepts for various applications. (BL - 3)	1	3	2	1									2	
				C212.5	Develop the graph model of the given problem through graph concepts (BL - 3)	2	3	3	1									2	
						1.6	**2.8**	**2.6**	**1**									**2**	
19	Computer Organization and Architecture	21CS2001	C213	C213.1	Describe the concepts of Functional Architecture and Basic Operations of Computing System. (BL-2)	3	3												
				C213.2	Interpret the representation of Fixed and Floating point numbers stored in digital computer. (BL-3)	2	3												
				C213.3	Illustrate the basics of Instruction set and design of control units to execute Computer instruction. (BL - 3)	2	2	1										1	
				C212.4	Analy the Memory System and their impact on Computer cost & performance. (BL - 4)	3	2											1	
				C212.5	Demonstrate the basic knowledge of I/O devices and Interfacing of I/O devices with computer. (BL - 3)	3	2												
						2.6	**2.4**	**1**										**1**	
20	Database Management	21CS2002	C214	C213.1	Describe database technologies and database design. (BL-2)	3	1											2	
				C213.2	Illustrate Relational data model and relational algebra for data models. (BL-2)	3	2											1	
				C213.3	Demonstrate queries, procedures for database creation in RDBMS.(BL-3)	3	2											2	

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	systems			C213.4	Apply functional dependencies and normalization for database design. (BL-3)	3	2											2	
				C213.5	Demonstrate transaction management and concurrency control techniques for database recovery. (BL-3)	3	1											1	
						3	**1.6**											**1.6**	
21	Mathematical Foundation for Computer Science	21CS2003	C215	C214.1	Understand the concepts associated with Mathematical Logic and Predicate calculus	3	2											3	
				C214.2	Learn The Basic Concepts About Relations, Functions, Algebraic Structures And To Draw Different Diagrams Like Lattice, Hasse Diagrams	3	3	1											
				C214.3	Understand The Elementary Combinatory And Pigeon-Hole Principle.	3	3												
				C214.4	Describe Functions, Various Types Of Recurrence Relations And The Methods To Find Out Their Solutions.	3	3	1											
				C214.5	Understand The Basic Concepts Associated With Graphs And Trees.	3	3	3											
						3	**2.8**	**1.667**										**3**	
22	Object Oriented Programming using Java	21CS2004	C216	C215.1	Describe the basic Elements of Java for problem solving.(BL-2)	3	2											1	
				C215.2	Demonstrate the concepts of arrays and strings for organizing data. (BL-3)	1	2	2										1	
				C215.3	Describe the concepts of object oriented programming. (BL-2)	2	3	1										2	1
				C215.4	Design the web applications through java applets. .(BL-3)	1	3	3										1	2
				C215.5	Develop Multi-threaded programs to improve the system performance . (BL-6)	3	3	3										1	1
						2	**2.6**	**2.25**										**1.2**	**1.33333**
23	Data Structures and Algorithms lab	21ES1513	C217	C216.1	Apply the Arrays and linked listsfor solving the problems. (BL -3)	2	2	2									1	1	1
				C216.2	Apply the stacks and queuesfor solving the given applications. (BL -3)	3	2	2									1	2	1
				C216.3	Implement operations on binary trees and binary search trees for given applications. (BL -3)	2	2	3	1								1	2	1
				C216.4	Implement searching and sorting algorithms for given applications. (BL -3)	2	2	3	1								1	2	1
						2.25	**2**	**2.5**	**1**								**1**	**1.75**	**1**
	Database Management Systems lab	21CS2501	C218	C217.1	Utilize SQL for creating database and performing data manipulation operations.(BL-3)	2	2	3										1	1
24				C217.2	Examine integrity constraints to build efficient databases. (BL-3)	1	3	3										1	2
				C217.3	Build PL/SQL programs including procedures, functions, cursors and triggers (BL-3)	1	3	3										1	2
				C217.4	Apply queries using advanced database design and Normalization. (BL-3)	1	3	3	3									1	2
						1.25	**2.75**	**3**	**3**									**1**	**1.75**
25	Object Oriented Programming	21CS2502	C219	C218.1	Apply the fundamental elements of java programming to solve given problems.(BL-3)	2	2	2									1	1	1
				C218.2	Implement the concepts of object oriented programming to solve the applications. (BL-3)	3	2	2									1	2	1

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23	Programming using Java Lab	21CS2502	C219	C218.3	Apply the Method overloading and exception handling mechanisms to solve given problems. (BL-3)	2	2	3	1								1	2	1
				C218.4	Apply the Multithreading and packages to improve the system performance. (BL-3)	2	2	3	1								1	2	1
						2.25	**2**	**2.5**	**1**								**1**	**1.75**	**1**
24	Career competency development I	21CD6001	C2110	C219.1	**Apply** the Basic concepts of **computing ability** to solve Quantitative Problems BL[3]	2	2				2								
				C219.2	**Apply Basic logical thinking** to solve Reasoning Problems BL [3]	2	2				2								
				C219.3	**Apply** Basic **analytical abilities** to solve Reasoning Problems Verbal Problems BL[3]	2	2				2								
						2	**2**				**2**								
25	Value added course/ Certificate course I	21CC6001	C2111	C2110.1	**Relate** the abilities with the expectations of industry. BL[2]													2	2
				C2110.2	**Develop** their inter-disciplinary skills. BL[2]													2	2
				C2110.3	**Apply** the skills for better employability. BL[3]													2	2

(2-2) CO-PO Mapping																			
26	Expolatory data analysis with R **using R**	21MA1007	C221	C221.1	Demonstrate the fundamental knowledge of R-Programming concepts for solving the engineering applications (BL-2)	2	3	2										2	
				C221.2	Apply data objects & probability commands for data manipulations (BL-3)	3	3	3	1									1	
				C221.3	Apply descriptive statistics and data distribution commands for statistical analysis (BL-3)	2	3	3	2									3	
				C221.4	Analyze hypothesis testing & graphical analysis on different data-sets for testable hypothesis and virtualization (BL-4)	1	3	3	3	2								2	
				C221.5	Analyze complex analytical models using formula syntax and regression for data analysis (BL-4)	2	3	3	3	2								2	
						2	**3**	**2.8**	**2.25**	**2**								**2**	
27	Computer Networks	21CS2005	C222	C222.1	Describe the concepts of layer approach to understand TCP/IP and OSI models. (BL-2)	3	1	2	2									2	2
				C222.2	Analyze the concept of data link layer to differentiate Error detection and Correction codes for a computer network. (BL - 4)	3	3	2	1								3	2	2
				C222.3	Analyze the concept of Network layer to differentiate various routing protocols for a network. (BL - 4)	3	3	2	2								3	2	2
				C222.4	Classify the transport protocols to understand transport layer services. (BL -2)	3	2	1	2								3	2	2
				C222.5	Apply the Application layer concepts to interpret Client Server Programming. (BL -3)	3	3	1	1								3	2	2
						3	**2.4**	**1.6**	**1.6**								**3**	**2**	**2**
	Operating			C223.1	**Describe** the concept operating system and operating system design. (BL-2)	1	2	2	1										
				C223.2	**Analyze** Process and CPU Scheduling, Process Coordination with concurrencies. (BL-3)	1	3	1	1										

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28	Operating Systems	21CS2006	C223	C223.3	**Identify** and evaluate Memory Management and Virtual Memory. (BL-3)	1	2	1	1									1	1
				C223.4	**Apply** the File System Interface. To directories (BL-3)	2	1	1	2										
				C223.5	**Understand** Mass Storage Structure and Protection Mechanism. (BL-2)	2	1	1	1									1	
						1.4	**1.8**	**1.2**	**1.2**									**1**	**1**
29	Software Engineering	21CS2007	C224	C224.1	Demonstrate the fundamental concepts and process models required to develop a software system. (BL-2)	3	2	2	1								3	3	2
				C224.2	Analyze the software requirements for modeling a software process. (BL - 4)	2	3	3	2								3	3	2
				C224.3	Illustrate the modeling strategies, architectural design concepts and component -level design for a software model. (BL - 2)	2	3	3	1								3	3	2
				C224.4	Design the user interface design and web app design through GUI techniques (BL- 3)	2	3	2	1								3	3	2
				C224.5	Demonstrate various testing strategies and techniques for developing quality software.(BL-2)	3	3	3	2								3	2	2
						2.4	**2.8**	**2.6**	**1.4**								**3**	**2.8**	**2**
30	Open Elective I	20EC3011	C225	C225.1	**Use** number systems, binary codes and Boolean algebra **to implement digital circuits**. **(BL-3)**	3	2	1										1	
				C225.2	**Apply** minimization techniques **on Boolean expressions**. **(BL-3)**	3	3	3	1									1	
				C225.3	**Design** combinational circuits **using logic gates**. **(BL-3)**	3	3	3	1									1	
				C225.4	**Analyze synchronous** sequential circuits. **(BL-4)**	3	1	2	1									1	
				C225.5	**Classify** the **programmable logic** devices & circuits. **(BL-2)**	2	2											1	
						2.8	**2.2**	**2.25**	**1**									**1**	
31	EXPOLATORY DATA Analysis WITH R LAB using R Lab	21MA1501	C226	C226.1	Configure R IDE tools and execute basic programs.(BL-2)	3	3			2								2	
				C226.2	Execute commands and built-in functions in R Programming.(BL-2)	2	2			2								1	
				C226.3	Implement data distribution and ANOVA techniques. (BL-2)	2				2								1	
				C226.4	Construct programs on Manipulating Data and Extracting Components. (BL-2)	3	3			2								2	
						2.5	**2.66667**			**2**								**1.5**	
32	Operating Systems & Computer Networks Lab	21CS2503	C227	C227.1	Implement datalink layer protocols, client server communication models. (BL-3)		3	2									1	2	3
				C227.2	Develop programs for routing, congestion control algorithms (BL-3)		3	3	1								1	2	2
				C227.3	Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, Priorit and Dead lock detetion,avoidance		2	2		2									3
				C227.4	Implement memory management schemes , page replacement schemes and File Organization techniques	2	2											3	
						2	**2.5**	**2.333**	**1**	**2**							**1**	**2.3333**	**2.66667**
33	Software Engineering Lab	21CS2504	C228	C228.1	Select suitable software development process model for the given scenario (BL-3)	1	3	3										2	3
				C228.2	Classify the requirements and prepare software requirements specification for projects and perform modeling (BL-2)	1	1	2						2				2	3
				C228.3	Make use of design techniques for effective software implementation (BL-2)	1	2	3		3				2				2	3

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				C228.4	Apply testing principles for validating software project.(BL-3)	1	2	3		3								2	3
						1	**2**	**2.75**		**3**				**2**				**2**	**3**
34	Career competency development II	20CD6002	C229	C229.1	**Apply** the moderate conceptual knowledge s of **computing ability** to solve Quantitative Problems BL[3]	2	2				2								
				C229.2	**Apply Moderate logical thinking** to solve Reasoning Problems BL [3]	2	2				2								
				C229.3	**Apply** moderate **analytical abilities** to solve Reasoning Problems Verbal Problems BL[3]	2	2				2								
						2	**2**				**2**								
35	Value added course/ Certificate course II	20CC6002	C2210	C2210.1	**Relate** the abilities with the expectations of industry. BL[2]													3	2
				C2210.2	**Develop** their inter-disciplinary skills. BL[2]													3	2
				C2210.3	**Apply** the skills for better employability. BL[3]													3	2
																		3	**2**

(3-1) CO-PO Mapping

36	Artificial Intelligence	21CS2008	C311	C311.1	Identify the importance of AI and intelligent agents related to its environment BL[2]	3	2											2	
				C311.2	Demonstrate the concepts of Problem Solving Agents by using uninformed search techniques BL[2]	3	3	2										3	2
				C311.3	Illustrate the concepts of Problem solving agents through informed search techniques and multi-agents through adversarial search BL[2]	3	3	3										3	3
				C311.4	Describe the concepts in representing knowledge base through Propositional logic and First-order logic for Logical Agents BL[2]	3	2	3										3	2
				C311.5	Explain the role of knowledge representation in forms of Machine learning and Techniques BL[2]	3	3	2	1									3	3
						3	**2.6**	**2.5**	**1**									**2.8**	**2.5**
37	Design and Analysis of Algorithms	21CS2009	C312	C312.1	Describe the **Concepts of Algorithms and Divide and Conquer technique** for real time problem solving **(BL-2)**	3	2	3	3									3	3
				C312.2	Illustrate **Greedy method and Dynamic programming techniques** for developing solutions of a given problem. **(BL-3)**	3	3	3	2									3	3
				C312.3	Apply the **Backtracking Techniques** for problem solving in trees and graphs. **(BL - 3)**	3	2	3	2									3	3
				C312.4	Solve the graph based problems through **Branch and Bound techniques. (BL - 3)**	3	2	3	2									3	3
				C312.5	Develop the algorithms for **NP-Hard and NP-Complete problems. (BL - 3)**	3	2	3	3									3	3
						3	**2.2**	**3**	**2.4**									**3**	**3**
38	Theory of Computation	21CS2010	C313	C313.1	Demonstrate the concepts of language to perform finite automata.(BL-3)	3	2											1	1
				C313.2	Demonstrate the finite automata to recognize patterns in programs.(BL-3)	3	3	3	1									3	1
				C313.3	Construct the Regular Grammar from Regular expression t specify how to form grammatically correct strings in the programming language(BL-3)	3	3	1	1									3	1

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				C313.4	Analyze the Context free grammar by minimizing redundancy from the grammar of a program. (BL-4)	2	3	2	2									3	1
				C313.5	Describe the Push down automata conceptsto access a limited amount of information on the stack in a program. (BL-2)	3	3	3	3									3	1
						2.8	**2.8**	**2.25**	**1.75**									**2.6**	**1**
39	Open Elective II Microprocessors & Microcontrollers	21EC3007	C314	C314.1	**Interpret** the working principles of 8086 micro processor **.** (BL-2)	1		1										1	
				C314.2	**Develop** assembly language programs using instruction set in 8086 microprocessor. (BL-3)	2	2		1	2									1
				C314.3	**Compare** various versions of MSP430 based on applications. (BL-2)	1	1	1										1	2
				C314.4	**Summarize** the interrupt types, addressing modes & memory organization of MSP430. (BL-2)	2	2	1	1	2									1
				C314.5	**Implement** serial communication protocols using MSp430. (BL-3)	1		1	1	1								1	
						1.4	**1.66667**	**1**	**1**	**1.66667**								**1**	**1.33333**
41	Artificial intelligence lab	21CS2505	C316	C316.1	Explore the methods of implementing algorithms using artificial intelligence techniques	3	2	2										2	2
				C316.2	Illustrate search algorithms	3	3	2										3	2
				C316.3	Demonstrate building of Logical and Learning Agents	3	3	3										3	3
						3	**2.66667**	**2.333**										**2.6667**	**2.33333**
42	Coding Lab I	21CS2506	C317	C317.1	Develop logical understanding of Basic Coding Skills													3	3
				C317.2	Create the ability to model real-world problems into Automated solutions													3	3
				C317.3	Apply Appropriate coding Skills to solve problems in diversified domains													3	3
																		3	**3**
43	Design and Analysis of Algorithms Lab	21CS2507	C318	C318.1	Apply **Divide & Conquer technique and perform analysis of Algorithem** for real time problems. (**BL-3**)	3	3	3	3									3	3
				C318.2	Apply **Greedy and Dynamic programming techniques** for a given problem. **(BL-3)**	3	3	3	3									3	3
				C318.3	Apply **Backtracking and Branch & Bound Techniques** to derive Optional solution for complex probelms. **(BL - 3)**	3	3	3	3									3	3
						3	**3**	**3**	**3**									**3**	**3**
44	Career competency development III	21CD6003	C319	C318.1	**Apply** the concepts of **computing ability** to solve Quantitative Problems BL[3]		2	2	2		2								
				C318.2	**Apply logical thinking** to solve Reasoning Problems BL [3]		2	2	2		2								
				C318.3	**Apply** analytical abilities to solve Reasoning Problems Verbal Problems BL[3]		2	2	2		2								
				C318.4															
							2	**2**	**2**		**2**								
45	Value added Course/Certificate Course III	21CC6002	C3110	C3110.1	**Relate** the abilities with the expectations of industry. BL[2]													3	3
				C3110.2	**Develop** their inter-disciplinary skills. BL[2]													3	3
				C3110.3	**Apply** the skills for better employability. BL[3]													3	3
				C3110.4															

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3-2 CO-PO Mapping																			
46	Humanities and Social Science Elective/MEFA	1HS5001-0	C321	C321.1	Understand the fundamentals of Economics viz demand,production,cost,revenue and markets	3	3											2	
				C321.2	understand the concept of production cost revenues for effective business decision	3	3	3										2	
				C321.3	understand how to invest their capital and maximize returns	3	2	3										3	
				C321.4	Apply the capital budgeting techniques	3	3	2	2									2	
				C321.5	Develop the accounting statements and evaluate the financial performance	3	3									3		3	
47	Data Analytics	21CS2011	C322	C322.1	Understand the competitive advantages of big data analytics														
				C322.2	Learn data analysis methods														
				C322.3	Gain knowledge on related tools for data analytics														
				C322.4	Analyze data by utilizing various statistical and data mining approaches														
				C322.5	Perform analytics on real-time streaming data														
48	Web Technologies	21CS2012	C323	C323.1	Createstatic web pages using HTML and CSS(BL-3)	1	2	2		2								1	2
				C323.2	Implement dynamic web pages and validate them using JavaScri	2	3	3	1	2								1	2
				C323.3	Create secure, usable database driven web applications (BL-3)	2	3	3	1	3								1	2
				C323.4	Develop web applications using Scripting Languages (BL-3)	1	2	3	1	2								1	2
				C323.5	Construct a well-defined web service. (BL-3)	2	2	3		2								1	1
49	Open elective III / Internet Of Things	20EC3006	C324	C324.1	Understand the core concepts, architecture, and components of IoT systems.	3	2	1		1							1	2	1
				C324.2	Design, develop, and deploy IoT applications using various sensors, microcontrollers, and communication protocols.	3	2	1		2							2	2	2
				C324.3	Analyze IoT data using cloud computing, edge computing, and data analytics techniques.	3	2	2	1	2							2	2	2
				C324.4	Identify and address security and privacy concerns in IoT systems.	3	2	2	1	2							2	2	2
				C324.5	Gain practical experience in building and prototyping IoT systems.	3	2	3		3							2	2	3
50	Professional elective II / Software Architecture	21CS4007	C325	C325.1	Demonstrate Software Architecture reference models and architecture business cycle for making a good Software Architecture	3	2	1										2	2
				C325.2	Choose different Software Architectural life cycles for designing a good architecture		3	2										2	3
				C325.3	Identify Quality Attributes, Functional attributes, and different types of tactics for creating architecture.	3	1	2										2	1

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	Architecture			C325.4	Develop the document of software architecture and views for creating architecture.	3	2	1										2	1
				C325.5	Develop real time projects by combining ATAM and CBAM frameworks with quality attributes.	2	3	2										2	2
51	Professional Elective III & cloud computing	21CS4014	C326	C326.1	Summarizethe basic concepts of Cloud technologies for development of Cloud applications (BL-2)	1	1											1	
				C326.2	Develop cloud Applications through Cloud Technologies(BL-3)	3	1											1	
				C326.3	Interpret Cloud service architectures in Cloud environment(BL-3)	1	2											2	1
				C326.4	Analyse the core issues of cloud computing. (BL-3)	2	1	2										1	1
				C326.5	Choose appropriate technologies, algorithms and approaches to usedin cloud Computing(BL-3)	1	1	1										1	
52	Coding Lab II	20CS2508	C327	C327.1	Develop logical understanding of Basic Coding Skills													3	3
				C327.2	Create the ability to model real-world problems into Automated solutions													3	3
				C327.3	Apply Appropriate coding Skills to solve problems in diversified domains													3	3
53	Data Analytics lab	21CS2508	C328	C328.1	Plan the operation required in data analytics.														
				C328.2	Apply basic operation required for data analytics														
				C328.3	Analyze the streaming process														
54	Web technologies Lab	21CS2509	C329	C329.1	Develop static user interfaces for web applications with HTML ar	3	3	2		3				2	2			3	3
				C329.2	Builddynamic user interfaces forclient-side scripting using JavaSc	3	2	3		3				2				3	3
				C329.3	Modela client server architectureusingPHP. (BL-3)	3	3	3		3				2	2			2	3
55	Career competency Development IV	21CD6004	C3210	C3210.1	**Apply** the Basic concepts of **computing ability** to solve Quantitative Problems BL[3]		2	2	2		2								
				C3210.2	**Apply Basic logical thinking** to solve Reasoning Problems BL [3]		2	2	2		2								
				C3210.3	**Apply** Basic **analytical abilities** to solve Reasoning Problems Verbal Problems BL[3]		2	2	2		2								

4-1 CO-PO Mapping

56	Cryptography and Network Security	21CS2013	C411	C411.1	Understand and apply the cryptographic algorithms to safeguard from intruders(BL2,3)	3	2						1					2	
				C411.2	Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack(BL-4)	3	3	3										3	
				C411.3	Implement the various key distribution, management and messa	3	3	1										1	
				C411.4	Identify information system requirements for Transport level, wireless network, EMail and IP(BL-2)	3	2	3					1					1	

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				C411.5	Design a network security system by implementing all the concepts of encryption and decryption algorithms(BL-6)	3	3	1					2					2	
57	Mobile Application Developme nt	21CS2014	C412	C412.1	Illustrate the developmental environment to run Android Applications. (BL 3)	3						1							
				C412.2	Demonstrate the knowledge of Android components for creating basic Android Applications. (BL 3)	2	2	2				1						1	1
				C412.3	Illustrate the concepts of layouts, resources and media to design GUI Applications.	3	3	2				1						2	1
				C412.4	Demonstratethe concepts of controls, dialogs and fragmentsfor creating Android Applications. (BL 3)	3	3	3				2						2	1
				C412.5	Designmenus, forms to access database and able to communicate with SMS, email		1	3				2						1	2
58	Machine Learning	21CS2015	C413	C413.1	Understand the concepts of computational intelligence like machine learning	3	2	1	1										
				C413.2	Understand and apply the various Machine learning strategies	1	3			1	2								
				C413.3	Familiar with basic concepts in artificial neural network and its learning methods	1	1	3	2	2									
				C413.4	Explore regression methods in Machine learning	1	3												
				C413.5	Design and analyze the instance based and reinforcement learning	1	3	2	3										
59	Open Elective IV/Renewab le Energy Conversion	21EE3008	C413	C413.1	understand various renewable energy systems in present scenario (BTL-2)	3	1	2											
				C413.2	Describe the existing solar and wind energy conversion system(BTL-2)	3	3					3							
				C413.3	Understand the various cycle operations in MHD SYSTEMS AND THE Bio -Energy conversion systems(BTL-2)	3	3	1				2							
				C413.4	Describe the existing Geothermal and Ocean Energy Conversion System(BTL-2)	3	3					2							
				C413.5	Extend the knowledge about working principleof varios Fuel cell technology(BTL-2)	3	3												
60	Professional Elective IV/Ethical Hacking	21CS4029	C414	C414.1	Understand the principles and techniques of ethical hacking.	3	2			2	3				2				
				C414.2	Conduct reconnaissance, footprinting, and scanning using various tools.	3	3	3	2	3	2				3				
				C414.3	Analyze vulnerabilities in networks and web applications.	2	3	2	3	2	3	2	2		3		2		
				C414.4	Perform penetration testing and follow industry-standard frameworks.	3	3	3	2	3	2			2	3				
				C414.5	Appreciate the ethical and legal responsibilities of an ethical hacker.	2	2			2	3	3	2		3		2		
	Professional			C415.1	Understand and apply core principles of cybersecurity.	3	2			2					2				
				C415.2	Assess and mitigate network and application vulnerabilities.	3	3		2	3					2				

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61	Professional Elective V/Cyber Security	21CS4030	C415	C415.3	Implement cryptographic techniques for secure communication.	2	3	3	3	3					3		2		
				C415.4	Identify and defend against common cyber threats and attacks.	3	2	3	2	3				2	3				
				C415.5	Understand legal, ethical, and regulatory aspects of cybersecurity.	2	2				3	3	2		3		2		
62	Mobile Application Developme nt Lab	21CS2510	C416	C416.1	Demonstrate data sharing with different applications and sending and intercepting SMS.(BL-2)	3	2	3	2	3							2	3	3
				C416.2	Develop an application for creating basic GUI components, Layouts and basic widgets.(BL-3)	3	3	2	2	3							2	3	3
				C416.3	Analyze the capability to implement the application for location tracking, work with databases, and creating some basic widgets.(BL-4	3	3	3	2	3							2	3	3
63	Machine Learning Lab	21CS2511	C417	C417.1	Introduction to Python and Python Libraries- NumPy, Pandas, Matplotlib, Scikit.	2	1											2	
				C417.2	Perform Data exploration and pre-processing in Python and Feature Engineering and Feature Selection Methods.	3	3	3	2	2	2							3	
				C417.3	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file	2	3	3	2		2							3	
				C417.4	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples	2	2	3		1								3	
64	Career competency Developme nt V	21CD6005	C418	C418.1	**Apply** the Basic concepts of **computing ability** to solve Quantitative Problems BL[3]		2	2	2		2								
				C418.2	**Apply Basic logical thinking** to solve Reasoning Problems BL [3]		2	2	2		2								
				C418.3	**Apply** Basic **analytical abilities** to solve Reasoning Problems Verbal Problems BL[3]		2	2	2		2								

4-2 CO-PO Mapping

66	Project work, seminar and internship	20CS7503	C421	C425.1	Identify the problem by using the fundamental knowledge and skills.	3	3	2	2		2		2	3	3	3			
				C425.2	Design a solution.to complex problems in a systematic approach.	2	3	2	3	2		2		3	3	3	2	2	2
				C425.3	Demonstrate a strong working knowledge and interact with team manner in a professional manner.	2	3	2	3	3	3	2		3	3	3	2	2	2