NARAYANA ENGINEERING COLLEGE:: NELLORE

DEPARTMENT OF CSE

COURSE OUTCOMES and PO Mapping-R20 -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	20MA1001	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	20CH1001	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	20ES1001	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	20EN1001	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				

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														2.50	3.00				
5	Chemistry Lab	20CH1501	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	20ES1504	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	20ES1506	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	20EN1501	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	Number Theory and Applications	20MA1002	C121	C121.1	Apply the properties of factorization, the division algorithm, greatest common divisors and find the solution. (BL-3)	3	3												
				C121.2	Apply Euler-Fermat's Theorem to prove relations involving prime numbers.(BL-3)	3	3												
				C121.3	Solve systems of linear congruences. (BL-3)	3	3	2											
				C121.4	Develop the knowledge to apply various applications. (BL-3)	3	3	1	1										
				C121.5	Develop various encryption methods and its applications. (BL-3)	3	3												
				C121.6	Apply RSA cipher & discrete log cipher in n-crypt in security system. (BL-3)	3	3	2	2										
						3.00	3.00	1.67	1.50										
10	Semiconductor Physics	20PH1004	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												

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				C122.4	Demonstrate the physics of semiconductors for electronic devices (BL-2)	3													
				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	20ES1003	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	20ES1009	C124	C124.1	Summarize the fundamental concepts of python programming. (BL - 2)	3	3											1	1
				C124.2	Apply the basic elements and constructs the python to solve logical problems. (BL - 3)	3	2	1										1	
				C124.3	Organize data using different data structures of python. (BL - 3)	3	2											1	2
				C124.4	Implement the files modules and packages in programming. (BL - 3)	3	1	1										1	2
				C124.5	Apply object oriented & exception handling concepts to build simple applications (BL-3)	3	2												1
				C124.6	Implement the concepts of Regular expressions and Turtle Graphics. (BL - 3)	3	1		1										2
						3	**1.83333**	**1**	**1**									**1**	**1.6**
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	20ES1508	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	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												

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	and IT Workshop			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**										
16	Python Programming Lab	20ES1512	C128	C128.1	Understanding and use of python- Basic Concepts (BL -2)	3	2	3										2	
				C128.2	Solve the concepts of python functions and data structures (BL - 3)	3	2	3										2	
				C128.3	Understand the concepts of files, modules, multithreading and regular	2	2	3	3									2	2
				C128.4															
						2.66667	**2**	**3**	**3**									**2**	**2**
17	Oral Communication Skills Lab	20EN1502	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																			
18	Data Structures and Algorithms	20ES1011	C211	C211.1	Analyze the searching algorithms to evaluate the time & space complexities.(BL-4)	3	2	2										2	
				C211.2	Apply the knowledge of stack and queues for various applications. (BL - 3)	1	3	3										2	
				C211.3	Apply the knowledge of linked lists and sorting techniques for various applications. (BL - 3)	1	3	3	1									2	
				C211.4	Apply the knowledge of tree concepts for various applications. (BL - 3)	1	3	2	1									2	
				C211.5	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	20CS2001	C212	C212.1	Describe the concepts of Functional Architecture and Basic Operations of Computing System. (BL-2)	3	3												
				C212.2	Interpret the representation of Fixed and Floating point numbers stored in digital computer. (BL-3)	2	3												
				C212.3	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**	
				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	

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20	Database Management systems	20CS2002 PC	C213	C213.3	Demonstrate queries, procedures for database creation in RDBMS.(BL-3)	3	2											2	
				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	20CS2003	C214	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	20CS2004	C215	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	20ES1514	C216	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**
24	Database Management Systems lab	20CS2501	C217	C217.1	Utilize SQL for creating database and performing data manipulation operations.(BL-3)	2	2	3										1	1
				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**
	Object			C218.1	Apply the fundamental elements of java programming to solve given problems.(BL-3)	2	2	2									1	1	1

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25	Object Oriented Programming using Java Lab	20CS2502	C218	C218.2	Implement the concepts of object oriented programming to solve the applications. (BL-3)	3	2	2									1	2	1
				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	20CD6001	C219	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	20CC6002	C21A	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	Statistical Analysis and Techniques using R	20MA1007	C221	C221.1	Demonstrate the fundamental knowledge of R-Programming concepts for solving the engineering applications (BL-2)	3	3	2									2	3	2
				C221.2	Apply data objects & probability commands for data manipulations (BL-3)	3	3	3	1								2	3	2
				C221.3	Apply descriptive statistics and data distribution commands for statistical analysis (BL-3)	3	3	3	2								2	3	2
				C221.4	Analyze hypothesis testing & graphical analysis on different data-sets for testable hypothesis and virtualization (BL-4)	3	3	3	3	2							2	2	2
				C221.5	Analyze complex analytical models using formula syntax and regression for data analysis (BL-4)	3	3	3	3	2							2	2	2
						3	**3**	**2.8**	**2.25**	**2**							**2**	**2.6**	**2**
27	Computer Networks	20CS2005	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**
				C223.1	**Describe** the concept operating system and operating system design. (BL-2)	1	2	2	1										

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28	Operating Systems	20CS2006	C223	C223.2	**Analyze** Process and CPU Scheduling, Process Coordination with concurrencies. (BL-3)	1	3	1	1										
				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	20CS2007	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	Statistical Analysis and Techniques using R Lab	20MA1501	C226	C226.1	Configure R IDE tools and execute basic programs.(BL-2)	2	3			2								1	
				C226.2	Execute commands and built-in functions in R Programming.(BL-2)	2	3			2								1	
				C226.3	Implement data distribution and ANOVA techniques. (BL-2)	3	2			2								1	
				C226.4	Construct programs on Manipulating Data and Extracting Components. (BL-2)	3	3			2								1	
						2.5	**2.75**			**2**								**1**	
32	Operating Systems & Computer Networks Lab	20CS2503	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**
				C228.1	Select suitable software development process model for the given scenario (BL-3)	1	3	3										2	3

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33	Software Engineering Lab	20CS2504	C228	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
				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	20CS2008	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**
	Design and Analysis of Algorithms	20CS2009	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
37				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**
				C313.1	Demonstrate the concepts of language to perform finite automata.(BL-3)	3	2											1	1

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S.No.	**SUBJECT NAME**	**SUBJECT CODE**	**COURSE CODE**	**CO - NUMBER**	**COURSE OUTCOMES**														
38	Theory of Computation	20CS2010	C313	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
				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	20CS2505	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	20CS2506	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	20CS2507	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	20CD6003	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**								

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45	Value added Course/Certificate Course III	20CC6003	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															
3-2 CO-PO Mapping																			
46	Humanities and Social Science Elective/MEFA	0HS5001-0	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	Mobile Application Development	20CS2011	C322	C322.1	Illustrate the developmental environment to run Android Applications. (BL 3)	3				1									
				C322.2	Demonstrate the knowledge of Android components for creating basic Android	2	2	2		1								1	1
				C322.3	CO 3 Illustrate the concepts of layouts, resources and media to design GUI Applications.	3	3	3		1								2	1
				C322.4	CO 4 Demonstratethe concepts of controls, dialogs and fragmentsfor creating Android Applications. (BL 3)	3	3	3		2								2	1
				C322.5	CO 5 Designmenus, forms to access database and able to communicate with SMS, email for an Android application (BL 3)		1	3		2								1	2
48	Web Technologies	20CS2012	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

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50	Professional elective II / Software Architecture	20CS4007	C325	C325.1	Demonstrate Software Architecture reference models and architecture business cycle for making a good Software	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
				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	20CS4014	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	Mobile Application Developme nt Lab	20CS2509	C328	C328.1	Demonstrate data sharing with different applications and sending and intercepting SMS.(BL-2)	3	2	3	2	3							2	3	3
				C328.2	Develop an application for creating basic GUI components, Layouts and basic widgets.(BL-3)	3	3	2	2	3							2	3	3
				C328.3	Analyze the capability to implement the application for location tracking, work with databases, and creating some	3	3	3	2	3							2	3	3
54	Web technologie s Lab	20CS2510	C329	C329.1	Develop static user interfaces for web applications with HTML a	3	3	2		3				2	2			3	3
				C329.2	Builddynamic user interfaces forclient-side scripting using JavaS	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 Developme nt IV	20CD6004	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								

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					4-1 CO-PO Mapping														
56	Cryptography and Network Security	20CS2013	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	
				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	Data Science	20CS2014	C412	C412.1	Understand the different types of data sources.	2	1	1											
				C412.2	Explain data pre-processing model and demonstrate the working on every data type .	2													
				C412.3	Apply different Exploratory Data Analysis techniques.	2	2												
				C412.4	Apply different similarity measures, distance measures to find similarity or distances between data.	2	2	3											
				C412.5	Demonstrate the handling of very large data using Map Reduce.	2													
58	Machine Learning	20CS2015	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/Renewable Energy Conversion	20EE3008	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	20CS4029	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		

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60	IV/Ethical Hacking	20CS4029	C414	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		
61	Professional Elective V/Cyber Security	20CS4030	C415	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				
				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	Data Science Lab	20CS2511	C416	C416.1	Explain R Programming by installing R Environment.		1	1	1										
				C416.2	Demonstrate R – Data types, Data Structures.		1		2									3	
				C416.3	Develop programming logic using R – Packages		1	3	3									3	
				C416.4	Analyze data sets using R – programming capabilities	2	3	2		2								2	
63	Machine Learning Lab	20CS2512	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	20CD6005	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,	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

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	seminar and internship			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