SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of Computer Science Engineering

COs

2018 Batch

Course Outcomes

Course Code	Course	Course Outcomes(CO) Code	Course Outcomes
1st Semester			
4BMA101	Engineering Mathematics – I	C101.1	List nth order derivatives of different functions. (L1)
		C101.2	Demonstrate the use of partial derivatives. (L2)
		C101.3	Explain the concept of vector differentiation. (L2)
		C101.4	Classify the 1st order differential equation. (L2)
		C101.5	Apply the knowledge of matrices techniques. (L3)
4BCH102/ 202	ENGINEERING CHEMISTRY	C102.1	Illustrate the concept of electrochemical cell by writing balanced redox reactions. (L2)
		C102.2	Explain the mechanism of corrosion in metals by framing stoichiometric chemical reaction. (L2)
		C102.3	Explain the polymer composites for photocatalytic and photovoltaic applications by examining the photogenerated charged carrier dynamics. (L2)
		C102.4	Classify different types of carbon forms and its applications by interpreting their structural properties. (L2)
		C102.5	Understand the synthesis of nanomaterials by determining appropriate solution method. (L2)
4BME103/ 203	COMPUTER AIDED ENGINEERING DRAWING AND RAPID PROTOTYPING	C103.1	Draw orthographic projections (TV, FV and SV) of points, straight lines, surfaces using instruments and CAD software (L1)
		C103.2	technique. (L3)
		C103.3	surfaces of solid geometry (L3)
		C103.4	Using isometric projections of combination of solids build model (L3)
		C103.5	Create models using rapid prototyping and laser cutting (L6)
4BEC105/ 205	MAKING WITH ELECTRONICS	C104.1	Associate basic engineering principles with operations of electronic components, equipment and circuits at an elementary level. (L2)

		C104.2	Identify and analyze basic electronic components and concepts using working models and experiments. (L1, L4)
		C104.3	Apply concepts learnt to design basic circuits to achieve desired specific outputs. (L3)
		C104.4	Develop in teams, simple interactive projects using Arduino that use the knowledge of circuit design and electronic components gained in the course. (L4)
		C104.5	Develop a Project with knowledge of module from Electronics. (L4)
	ENVIRONMEN	C105.1	Outline the expected consequences of continuous environment degradation in the society by relevant data analysis. (L2)
		C105.2	Demonstrate a rationale for climate change adaptation and mitigation by proposing appropriate actions in key sectors. (L2)
		C105.3	Explain the key issues under negotiation by summarizing the international climate change legal and policy framework. (L2)

4BHS105/ 205	T AND SUSTAINABILI TY	C105.4	Demonstrate knowledge of environment sustainability by analyzing relevant data about industrial impact on environment. (L2)
4BHS106	PROFESSIONA L COMMUNICA TION – I	C106.1	Identify and predict accurately use of grammar, punctuation and vocabulary in different types of communication. (L2)
		C106.2	Apply basic skills of paraphrasing and rewriting by taking and making effective notes. (L3)
		C106.3	Compose engaging creative writing pieces through techniques of speculation and prediction. (L6)
		C106.4	Write compelling emails using appropriate writing etiquette and rules of grammar. (L3)
		C106.5	Write compelling formal and informal letters. (L3)
	INDUCTION PROGRAM	C107.1	The groups which are formed should function as mentor – Mentee network.
		C107.2	A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc.
		C107.3	For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.
		C107.4	Such a group should remain for the entire 4 – 5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/ discipline.
2nd Semster			
4BMA201	ENGINEERING MATHEMATI CS – II	C201.1	Understand discrete and continuous probability distributions to resolve various engineering problems. [L2]
		C201.2	Apply the method of least squares to estimate the parameters of a regression model. [L3]
		C201.3	Implement Test of Hypothesis for a population parameter for small sample and large sample cases. [L3]
		C201.4	Recognizing Complex Number System, Elementary complex functions and analytic functions. [L1]
		C201.5	Interpret Cauchy integral formula and Cauchy Residue theorem to solve the complex integration. [L2]
4BPH122/ 222	ENGINEERING PHYSICS FOR CSE and IT	C202.1	Explain matter waves, Schrodinger's time independent wave equation and various features of wave function. [L1]
		C202.2	Describe applications of Schrodinger time independent wave equation using elementary problems such as infinite potential well, finite potential and potential barrier. [L2]
		C202.3	Explain drift and diffusion of charge carriers in semiconductor physics. [L2]
		C202.4	Describe I-V characteristics of PN junction diode and BJT. [L1]
		C202.5	Explain the features of superconductivity and its applications. [L2]
		C202.6	Describe the role of various measuring tools for performing experiments. [L1]
		C202.7	Explain the experimental setup, observed measurements and corresponding results using appropriate physical quantities and theoretical formulae. [L1]
		C203.1	Analyze electrical circuits by relevant Laws in DC circuits. (L2)
		C203.2	Demonstrate the knowledge of single phase and three-phase power generation by using the phasor diagrams. (L2)
		C203.3	Select suitable transformer for a given application by considering its design parameters. (L1)

	BASIC	C203.4	Describe the working principle of DC Machine, generators and motors (L2)
4BEE103/ 203	ELECTRICAL ENGINEERING	C203.5	Illustrate the concept of rotating magnetic field and applications (L1)
		C204.1	Select appropriate hand and power tools, machines, equipment and materials and demonstrate their correct use for simple making tasks (L3)
		C204.2	Creating new models with the help of scrap materials. (L6)
	ENGINEERING		Demonstrate sheet metal model using development techniques,
4BME104/	WORKSHOP	C204.3	adhesives and fasteners. (L3)
204	PRACTICE	C204.4	Demonstrate welding technology for model making. (L3)
		C205.1	Explain the basic constructs of C language. (L2)
		C205.2	Execute, compile and debug programs in C language. (L5)
		C205.3	Implement programs involving user-defined data types, decision structures, loops, functions, pointers, structures and union , enumeration, file handling and pre-processor directives in C. (L3)
	PROGRAMMI NG FOR PROBLEM	C205.4	Given a computational problem, identify and abstract the programming task involved. (L3)
4BCS105/ 205	SOLVING	C205.5	Develop an application using C programming to solve real-life problem. (L6)
		C206.1	Enhance reading comprehension, writing, listening and speaking skills needed to effective communication (L3)
		C206.2	Present effectively through various modes of presentation (L3)
		C206.3	Apply skills of socializing and networking in day to day professional communication. (L3)
	PROFESSIONA L COMMUNICA TION – II	C206.4	Express ideas opinions and to participate in group discussion. (L2)
4BHS206		C206.5	Understand the cultural sensitivity in communication and use it effectively. (L2)
		C207.1	Formulate original thought, opinions and insights on engineering by critically analyzing the relationship between Engineering and Society, Environment, Philosophy, Economics and Polity by considering their positive and negative impact on each other (L5)
		C207.2	Compare engineering innovations/ innovators from different periods of history by explaining their historical significance. (L2)
4BHS107/ 207	MODERN HISTORY OF ENGINEERING	C207.3	Explain the value and importance of professional and ethical responsibility in the engineering profession by analyzing impact of engineering on the world. (L2)
			3rd Semester
		C301.1	Apply the propositional and predicate logic in symbolic representations and validity tests. (L3)
		C301.2	Interpret the relations and functions in constructing the applications of Information Science. (L2)
		C301.3	Demonstrate the knowledge of recurrence relation by solving relevant mathematical problems. (L2)
	DISCRETE MATHEMATI CAL	C301.4	Demonstrate the properties of integers by using Mathematical induction. (L2)
	STRUCTURES	C301.5	Analyze the message coding, message transmission error detection and
4BCS301			correction using group theory. (L3)
		C302.1	Demonstrate the working principles of BJT and FET. (L2)
		C302.2	Construct and realize Logic gates using transistors. (L3)
		C302.3	Demonstrate the knowledge of Karnaugh maps by simplifying the algebraic equations and design the combinational circuits. (L2)
		C302.4	Design sequential Logic circuits and verify them by implementing them in hardware. (L2).

4BCS302	ANALOG AND DIGITAL ELECTRONICS	C302.5	Demonstrate the knowledge on VHDL by realizing combinational and sequential circuits and also develop Finite state machine. (L2)
4BCS303	DATA STRUCTURES USING C	C303.1	Explain different concepts C programming. (L2)
		C303.2	Apply the programming concepts in C for problem solving. (L3)
		C303.3	Explain the concepts of various data structures. (L2)
		C303.4	Illustrate the applications of data structures. (L2)
		C303.5	Develop a solutions to problem using appropriate data structure. (L3)
4BCS304	COMPUTER ORGANIZATION AND ARCHITECTURE	C304.1	Illustrate the various functional units of digital computers (L2)
		C304.2	Illustrate different concepts of CPU (L2)
		C304.3	Outline instruction execution using pipeline (L2)
		C304.4	Apply various hardware software concepts on instructions to exploit ILP (L3)
		C304.5	Explain Cache optimization techniques to improve system performance (L2)
4BCS305	PROGRAMMING WITH PYTHON	C305.1	Explain the syntax and semantics of python programming language and interpret the concepts of object oriented programming. (L2)
		C305.2	Create python programs using core data structures. (L2)
		C305.3	Analyze various run-time exceptions and can handle those exceptions. (L4)
		C305.4	Apply python packages in solving real-time problems. (L3)
		C305.5	Understand and apply visualization techniques. (L2)
4BHS306	PROFESSIONAL COMMUNICATION – III	C306.1	Present effectively with an understanding of various aspects of presentation. (L3)
		C306.2	Develop persuasive proposals by incorporating fundamental writing techniques at an intermediate level. (L3)
		C306.3	Develop effective reports by incorporating fundamental writing techniques at an intermediate level. (L3)
		C306.4	Construct references by using a referencing style that is appropriate to the type of academic writing. (L6)
		C306.5	Construct graphical representation of information by accurately interpreting and visualizing the given data. (L4)
4BHS307	PREPARE PROGRAM – I	C307.1	Apply number theory and speed calculation methods for the quick computation and manipulation of numbers. (L3)
		C307.2	Apply the theory of linear and quadratic equations using methods (indeterminate systems, equation comparisons etc) of equation formation to solve problems in several domains (e.g age problems). (L3)
		C307.3	Analyze distributive and arrangements puzzles to conclude logical solutions that adhere to the given parameters. (L4)
		C307.4	Demonstrate use of integral elements of public communication during a professional presentation. (L3)
		C307.5	Apply Basic English grammar rules (parts of speech, components and types of sentences) to identify errors in texts and construct correct sentences. (L3)
4BHS308	DESIGN THINKING – I	C308.1	Analysis user needs using structured techniques to discover unique product opportunity areas (L4)
		C308.2	Design solutions that tackle a given challenge by using iterative ideation techniques to generate alternative ideas, refine concepts and select the appropriate solution (L6)
		C308.3	Apply techniques of effective communication and collaboration to deliver convincing presentations, share and receive feedback, work effectively in teams and visualize their ideas (L3)
		C308.4	Demonstrate professionalism by adhering to deadlines, focusing on quality of work, maintaining detailed documentation and effectively using platforms for digital collaboration (L2)

4th semester			
4BCS401	ENGINEERING MATHEMATICS for CS and IT	C401.1	Explain the basic concepts of graph theory. [L2]
		C401.2	Solve problems involving vertex and edge colouring [L3]
		C401.3	Solve linear recurrence relations by recognizing homogeneity, linearity and constant coefficients. [L3]
		C401.4	Interpret and solve engineering problems using differential equation. [L2]
		C401.5	Solve linear and non-linear system of equations through numerical techniques. [L3]
4BCS402	DESIGN AND ANALYSIS OF ALGORITHM	C402.1	Identify various algorithm design techniques and strategies. (L1)
		C402.2	Represent various asymptotic performance of algorithm. (L2)
		C402.3	Illustrate the computational complexity of different algorithms. (L5)
		C402.4	Analyse and find the best algorithm for real time problem solving. (L4)
		C402.5	Construct best algorithm for real time problem solving. (L3)
4BCS403	SOFTWARE ENGINEERING	C403.1	Identify the various aspects of Software Product Engineering (L1)
		C403.2	Explain common Software Lifecycle processes including waterfall (linear), incremental approaches (such as Unified process), and agile approaches. (L2)
		C403.3	Prepare technical documentations and make presentations on various aspects of a software development project, including the technical aspects (architecture, design, quality assurance) as well as the managerial aspects (planning, scheduling, and delivery). (L3)
		C403.4	Explain the basics of software testing (L2)
		C403.5	Explain the various software cost estimation models (L2)
4BCS404	OBJECT ORIENTED PROGRAMMING USING JAVA	C404.1	Explain the Object Oriented Programming paradigm concepts. [L2]
		C404.2	Apply object oriented programming concepts for problem solving. [L3]
		C404.3	Explain the programming constructs in Java. [L2]
		C404.4	Explain the various packages, classes, interfaces in Java. [L2]
		C404.5	Develop applications in Java. [L3]
4BCS405	OPERATING SYSTEMS	C405.1	Explain different concepts for OS.(L2)
		C405.2	Demonstrate the concepts of process synchronization and deadlocks.(L2)
		C405.3	Illustrate memory management, secondary storage and Input /Output management concepts (L2)
		C405.4	Apply different operating system concepts for solving different scenarios. (L3)
		C405.5	Explain various protection and security issues in OS. (L2)
4BHS406	PROFESSIONAL COMMUNICATION – IV	C406.1	Plan, prepare and create business profile, portfolios, brochures, newsletters, banners and Posters. (L6)
		C406.2	Apply the different aspects technical written communication in writing. (L3)
		C406.3	Compose different types of business Correspondence. (L6)
		C406.4	Compose documents related to professional correspondence. (L6)
		C406.5	Demonstrate different effective strategies of presentation keeping in mind the importance of effective Listening. (L3)
		C407.1	Apply the concepts of ratio, proportions, percentages and averages to calculate class/set relationships (compound interest, weighted average etc) and complete component analysis (mixtures, distribution of profits in partnership etc). (L3)
		C407.2	Integrate concepts of logical connectives to breakdown linguistic components and solve puzzles that use logical connectors. (L4)

4BHS407	PREPARE PROGRAM – II	C407.3	Analyse data through the methods of selection and comparisons to prepare logical solutions to puzzles based on given parameters. (L3)
		C407.4	Recognize the meaning of words using the root-prefix-suffix structure and apply their extensive vocabulary in verbal and written contexts. (L1, L3)
		C407.5	Utilize techniques of public debate within a team by taking on different roles and articulating complex ideas in a persuasive manner. (L4)
4BHS408	DESIGN THINKING – II	C408.1	Analysis user needs using structured techniques to discover unique product opportunity areas (L4)
		C408.2	Design solutions that tackle a given challenge by using iterative ideation techniques to generate alternative ideas, refine concepts and select the appropriate solution (L6)
		C408.3	Apply techniques of effective communication and collaboration to deliver convincing presentations, share and receive feedback, work effectively in teams and visualize their ideas(L3)
		C408.4	Demonstrate professionalism by adhering to deadlines, focusing on quality of work, maintaining detailed documentation and effectively using platforms for digital collaboration (L2)
4BCS481	PYTHON PROGRAMMIN G	C409.1	Explain the syntax and semantics of python programming language and interpret the concepts of object oriented programming. (L2)
		C409.2	Create python programs using core data structures. (L2)
		C409.3	Analyze various run-time exceptions and can handle those exceptions. (L4)
		C409.4	Apply python packages in solving real-time problems. (L3)
		C409.5	Understand and apply visualization techniques. (L2)
4BCS482	COMPUTER SYSTEMS FOR ENGINEERS	C410.1	Explain the fundamental programming concepts. (L2)
		C410.2	Identify the various programming constructs to solve problems. (L3)
		C410.3	Explain the concepts of data visualization. (L2)
		C410.4	Explain System Development process. (L2)
		C410.5	Explain the various applications of systems and information technology in different domains. (L2)
4BCS483	INTRODUCTION TO SOFTWARE ENGINEERING	C411.1	Identify the various aspects of Software Product Engineering (L1)
		C411.2	Understand common Software Lifecycle processes including waterfall (linear), incremental approaches (such as Unified process), and agile approaches (L2)
		C411.3	Prepare technical documentations and make presentations on various aspects of a software development project, including the technical aspects (architecture, design, quality assurance) as well as the managerial aspects (planning, scheduling, and delivery) (L3)
		C411.4	Understand the basics of software testing (L2)
		C411.5	Explain the various software cost estimation models (L2)
5th Semester			
4BHS5A1/ 6A1	BUSINESS MANAGEMEN T FOR ENGINEERS	C501.1	Demonstrate the concepts related to entrepreneurship issues in business ideas. (L3)
		C501.2	Independently analyse the factors influencing the practice of management in different contexts. (L3)
		C501.3	Develop suitable economic strategy regarding common business problems. (L3)
		C501.4	Analyse the marketing strategy for common engineering business problems. (L4)
		C501.5	Illustrate the leadership qualities in the operation of a new venture. (L4)

4BCS504	MICROPROCESSORS	C502.1	Explain architecture and addressing modes of 8086. (L2)
		C502.2	Analyze the instruction set of 8086. (L2)
		C502.3	Write assembly language programs for 8086. (L4)
		C502.4	Explain Stacks and Interrupts in 8086. (L2)
		C502.5	Analyze bus configuration and interfacing of 8086. (L2)
4BCS503	DATABASE MANAGEMENT SYSTEMS	C503.1	Explain the fundamental concepts of a database management system. (L2)
		C503.2	Develop the logical design of the database using data modelling concepts. (L3)
		C503.3	Explain SQL programming constructs and relational model concepts. (L2)
		C503.4	Explain the concepts of transaction processing, concurrency control and recovery. (L2)
		C503.5	Make use of SQL to solve wide range of Database problems. (L3)
4BCS502	DATA COMMUNICATION AND COMPUTER NETWORKS	C504.1	Outline basic concepts in data communications, OSI and TCP/IP Protocol Stack. (L2)
		C504.2	Understand the transfer of data from source to the destination using different protocols and addressing. (L2)
		C504.3	Summarize the functions of Application layer protocols and how to meet the QoS requirements in networking. (L2)
		C504.4	Identify the limits and importance of compression, encoding, sampling, quantization methods. (L3)
		C504.5	Demonstrate how the communication is achieved securely without using any kind of connection. (L2)
4BCS505	FORMAL LANGUAGE AND AUTOMATA THEORY	C505.1	Explain the concepts in automata theory and formal languages and also apply finite state machines for modeling and solving computing problems. (L3)
		C505.2	Explain and implement the concepts of regular languages and context-free languages for solving problems. (L3)
		C505.3	Construct context free grammars, Push down Automata and explain the mechanism in it. (L3)
		C505.4	Describe the Properties of Context-Free Languages and explain the concepts in Turing Machine. (L2)
		C505.5	Explain decidability and intractability of computational problems. (L2)
4BHS506	PROFESSIONAL COMMUNICATION – V	C506.1	Compose Abstract and Literature Review as parts of academic writing (L5)
		C506.2	Prepare agenda, Minutes and Memos in specific business set up (L5)
		C506.3	Apply skills of argumentation using various techniques of arguments and deliberation. (L3)
		C506.4	Exhibit basics of interview etiquette in a given professional set up (L3).
		C506.5	Plan and prepare presentation using media and advertisements (L5)
		C507.1	Students will use the concepts of work-time-efficiency and distance- time-speed to solve problems related to the measurement of effort or performance. (L3)
		C507.2	Students will analyze geometric shapes and use mensuration formulas to mathematically measure 2D and 3D solids. (L4)

4BME507	PREPARE PROGRAM – III	C507.3	Students will illustrate their conceptual knowledge of blood relationships and direction sense through the creation of schematic diagrams and solving related problems. (L3)
		C507.4	Students will apply the concepts of input-output, series, as well as coding and decoding to discern specific patterns (finding the odd term, types of codes etc) from given data to solve problems.(L3)
		C507.5	Students will utilize verbal reasoning logic to solve tasks based on verbal data (para-completion, para- jumbles etc). (L4)
		C507.6	Students will demonstrate their reading and comprehension abilities by understanding a variety of writing styles and differentiating between close interpretations of text. (L3)
4BCS508	MINI PROJECT – I	C508.1	Conduct a survey of several available literature in the preferred field of study. (L5)
		C508.2	Demonstrate practical knowledge within the chosen area of technology for project development. (L2)
		C508.3	Analyze the problem requirements and arrive at workable design solutions. (L4)
		C508.4	Compare and contrast the several existing solutions for the attempted problem. (L5)
		C508.5	Summarize the report and present the findings of the study conducted in the preferred domain. (L2)
4BCS511	DATA MINING	C509.1	Explain the concepts of Data mining and its issues. (L1)
		C509.2	Analyze and apply association rule mining techniques. (L3)
		C509.3	Analyze various classification algorithms. (L2)
		C509.4	Elaborate the clustering algorithms. (L3)
		C509.5	Explain various density based methods. (L1)
4BCS512	CLOUD COMPUTING	C510.1	Explain main concepts, key technologies, strengths and limitations of cloud computing. (L2)
		C510.2	Explain the cloud enabling technologies that help in the development of cloud. (L2)
		C510.3	Develop the ability to use the architecture of compute and storage cloud, service and delivery models. (L3)
		C510.4	Explain core issues of cloud computing such as resource management and security. (L2)
		C510.5	Choose the appropriate technologies, algorithms and approaches for implementation and use of cloud. (L3)
4BCS513	DATA VISUALIZATION	C511.1	Explain the basic concepts of Data Visualization. (L2)
		C511.2	Analyze the basic visualization tools to understand the data. (L4)
		C511.3	Apply specialized visualization tools to make effective decisions. (L3)
		C511.4	Illustrate the advanced visualization tools. (L2)
		C511.5	Analyze geospatial data using visualization tools. (L4)
6th Semester			
4BHS6A1/ 5A1	OF GLOBALIZATION AND SUSTAINABLE DEVELOPMENT	C601.1	Demonstrate understanding of globalization process with emphasis on inter-dependence of communities and societies. (L1)
		C601.2	Analyse the critical issues in social development in the given context. (L2)
		C601.3	Develop technological interventions for social and community development. (L3)
	INFORMATION AND	C602.1	Identify fundamental notions of system security, threats, vulnerabilities, attacks and countermeasures. (L3)
		C602.2	Explain the various concepts of information network security. (L2)
		C602.3	Illustrate key distribution, key management issues and different cryptographic standards and certificates. (L2)
		C602.4	Explain the concepts of authentication, cyber law, web security and cyber ethics. (L2)

4BCS602	NETWORK SECURITY	C602.5	Develop various network algorithms and simulate wired/wireless networks to evaluate different network parameters. (L3)
4BCS603	MOBILE AAPLICATION DEVELOPMENT	C603.1	Explain the fundamental concepts of mobile application development. [L2]
		C603.2	Design responsive user interfaces that work across a wide range of devices. [L6]
		C603.3	Demonstrate the knowledge of data persistence in mobile applications. [L2]
		C603.4	Outline networking and web services concepts in mobile applications. [L2]
		C603.5	Apply the steps involved in publishing mobile application to share with the world. [L3]
4BCS604	COMPILER DESIGN	C604.1	Explain the concepts in different phases of compilation with compile time error handling. (L2)
		C604.2	Compare and explain top down and bottom up parsers, and develop appropriate parser to produce parse treerepresentation of the input. (L3)
		C604.3	Illustrate syntax-directed translation schemes for a given context free grammar and explain the various concepts in run-time environments. (L2)
		C604.4	Explain the various concepts in intermediate code generation and interpret for statements in high level language. (L2)
		C604.5	Apply optimization techniques to intermediate code and construct machine code for high level language program. (L3)
4BCS502	ARTIFICIAL INTELLIGENCE	C502.1	Elucidate the basic concepts of Artificial Intelligence. (L2)
		C502.2	Analyse Artificial Intelligence techniques, such as search algorithms, for problem solving. (L4)
		C502.3	Apply techniques of Knowledge Representation and Planning. (L3)
		C502.4	Apply knowledge of reasoning in the presence of incomplete or uncertain information. (L3)
		C502.5	Explain different forms of Learning. (L2)
4BHS606	PROFESSIONAL COMMUNICATION – VI	C606.1	Demonstrate the advanced skills of presentation. (L3)
		C606.2	Compose Technical Documents following proper format and style (L6)
		C606.3	Evaluate cases pertaining to a specific domain and recommend innovative suggestion/s to the case. (L4)
		C606.4	Apply the registers of technical English in oral and written mode of communication.(L3)
		C606.5	Collaborate and express themselves in an Interview round. (L6)
		C607.1	Students will infer the concepts of permutation, combination, and probability from a given set to solve problems of various arrangements (circular, linear etc) and criteria (expected value, biased dice etc). (L4)
		C607.2	Students will apply concepts from statistics (mean, median etc) and progressions (AP, GP, HP) to analyze groups of numbers on the mentioned parameters. (L3)
		C607.3	Students will use indices and surds to solve problems related to representation of numbers (large integers, irrational roots etc). (L3)
		C607.4	Students will examine four types of logical statements to solve puzzles based on syllogisms. (L4)

4BME607	PREPARE PROGRAM – IV	C607.5	Students will apply the concepts of venn diagrams and cubes to solve puzzles using set theory, breaking-building rules etc . (L3)
		C607.6	Students will be able to combine logic with their knowledge of advanced English vocabulary and grammar to solve verbal data tasks(e.g. para-completion etc) and articulate their ideas. (L4)
4BCS608	MINI PROJECT – II	C608.1	Demonstrate practical knowledge within the chosen area of technology for project development. (L2)
		C608.2	Identify, analyze, formulate and handle computer/IT projects with a comprehensive and systematic approach to give workable design solutions (L4)
		C608.3	Conduct a survey of several available literature in the preferred field of study and Compare the several existing solutions for the attempted problem. (L5)
		C608.4	Propose innovative solution for the development of components, processes or technologies in CS/IT field. (L6)
		C608.5	To report and present the findings of the study conducted in the preferred domain as well develop effective communication skills for presentation of project related activities. (L3)
4BCS621	No-SQL DATABASES	C609.1	Elaborate the fundamental concepts of No-SQL databases. (L2)
		C609.2	Analyze the features and use cases of key-value databases. (L3)
		C609.3	Explain the features and challenges pertaining to document databases. (L2)
		C609.4	Illustrate the characteristics of column oriented No-SQL databases. (L4)
		C609.5	Describe the design and use cases of graph databases. (L3)
4BCS622	STORAGE AREA NETWORKS	C610.1	Explain basic concepts for Storage systems (L2)
		C610.2	Apply the concepts of storage networking technologies. (L3)
		C610.3	Explain the concepts in Backup, Archive and Replication. (L2)
		C610.4	Analyse the concepts of cloud computing and virtualization. (L4)
		C610.5	Explain various concepts in managing and securing storage infrastructure (L2)
4BCS624	PARALLEL COMPUTING	C611.1	Explain the scalability and clustering issues in parallel computing. (L2)
		C611.2	Infer the various technologies enabling parallel computing. (L2)
		C611.3	Explain the different types of interconnection networks. (L2)
		C611.4	Analyze different parallel programming models for real time problems. (L4)
		C611.5	Explain the software support needed for shared memory programming. (L2)
7th Semester			
4BCS701	MACHINE LEARNING	C701.1	Explain basic concepts of Machine Learning. (L2)
		C701.2	Analyse Data to perform Exploratory Data Analysis. (L4)
		C701.3	Implement Supervised Machine Learning algorithms to solve problems. (L6)
		C701.4	Implement Un-Supervised Machine Learning algorithm to analyse data. (L6)
		C701.5	Evaluate models to perform Model Selection. (L5)
	DATA ANALYSIS	C702.1	Explain the syntax and semantics of Python Programming language. (L2)
		C702.2	Demonstrate proficiency in handling Strings and File systems. (L2)
		C702.3	Apply python packages in solving real-time problems. (L3)
		C702.4	Build Web Services and introduction to Network and Database Programming in Python. (L3)

4BCS702	USING PYTHON	C702.5	Interpret Data Visualization concepts in Python. (L2)
4BCS703	INTERNSHIP	C703.1	Demonstrate the skills in professional career goals. (L2)
		C703.2	Administer the insight into a possible career path of interest with organizational structure, roles and responsibilities. (L3)
		C703.3	Develop professional connections with leadership strategy and skill development. (L4)
		C703.4	Identify the professions to suit the interest as a result of this experience. (L3)
		C703.5	Conquer additional skills that will need to be developed to ensure career readiness such as new technology, developing a broader network, additional coursework. (L4)
4BHS704	PREPARE PROGRAM – V	C704.1	Students will be able to apply number theory concepts and formulas to solve problems of base system, remainder theorem etc. (L3)
		C704.2	Students will be able to categorize contradictions within the area of binary logic to solve problems using concepts of contradictions truth tellers, liars and alternators.
		C704.3	Students will be able to solve types of pattern recognition problems (fillers, calendar etc) by utilizing different functions that fit the given criteria. (L3)
		C704.4	Students will be able to analyze the sufficiency of data and interpret its specific components by solving problems using data reasoning and interpretation of its numerical and graphic representations. (L4)
		C704.5	Students will be able to make use of advanced arithmetic, algebra and mensuration techniques to solve a variety of problems using a range of concepts from partnership to permutation & combination. (L3)
		C704.6	Students will be able to apply written and verbal communication techniques by articulating themselves in the format of discussion, debate, interview, essay, letter etc. (L3)
4BCS705	CAPSTONE PROJECT – DESIGN	C705.1	Demonstrate engineering knowledge and its framework for its implementation in the project design as well work in groups taking leadership role and communicate effectively (L2)
		C705.2	Survey relevant literature in the chosen field of study that allows interrelation of design and research (L4)
		C705.3	Model a prototype/ concept design that exhibits the feasibility of the solution from cost, engineering and environmental aspects. (L3)
		C705.4	Justify the project design with a structured report that covers all the work carried out between framing the problem statement to the project design. (L5)
		C705.5	Design conceptual ideas that address the issues with respect to real world problems. (L6)
4BCS731	ETHICAL HACKING	C706.1	Describe the basics of the ethical hacking. (L2)
		C706.2	Describe the foot printing and scanning. (L2)
		C706.3	Demonstrate the techniques and countermeasures for system hacking. (L3)
		C706.4	Characterize the malware and their attacks. (L2)
		C706.5	Analyze and prevent the security attacks in different environments. (L4)
		C707.1	Characterize real-time systems and describe their functions. (L2)
		C707.2	Analyze various Clock-Driven Scheduling approaches. (L3)
		C707.3	Apply formal methods to analyze and design a priority-driven scheduling of periodic tasks. (L4)
		C707.4	Compare the methods for scheduling aperiodic and sporadic jobs in priority-driven systems. (L3)

4BCS732	REAL TIME SYSTEMS	C707.5	Analyze various resources and resource access control approaches. (L3)
4BCS733	QUANTUM COMPUTING	C708.1	Describe the framework of quantum computation
		C708.2	Explain the differences between classical computation and quantum computation
		C708.3	Explain the concept of quantum entanglement and quantum teleportation
		C708.4	Implement single cubic gates
		C708.5	Explain how quantum computation may be applied in future technologies
4BCS741	OPTIMIZATIO N TECHNIQUES	C709.1	Remember the basic concepts of optimization. (L1)
		C709.2	Recognize methods of optimization techniques. (L2)
		C709.3	Formulate and solve linear programming problems. (L2)
		C709.4	Obtain solutions to constrained and unconstrained Non-linear programming problems. (L2)
		C709.5	Determine the integer solutions to Linear Programming Problems. (L2)
4BCS742	DIGITAL SIGNAL PROCESSING	C710.1	Explain the sampling theorem and characterize basic properties of discrete time signals and systems and also estimate the response of the system through convolution. (L2)
		C710.2	Demonstrate the frequency transforms for the signal using DFT, FFT and DCT. (L2)
		C710.3	Design IIR and FIR filters. (L3)
		C710.4	Familiarize the basic mechanism of speech production and learn the basic concepts of methods for speech analysis and parametric representation of speech. (L2)
		C710.5	Explain the DSP processors and getting the concept of Image processing. (L2)
4BCS743	EMBEDDED SYSTEMS	C711.1	Classify an Embedded systems based on its attributes and illustrate various steps in design process.
		C711.2	Distinguish various I/O ports, communication protocols and Timers used in an Embedded system.
		C711.3	Classify and explain various peripherals of an Embedded Systems.
		C711.4	Demonstrate characteristics and attributes of an embedded system, hardware /software co- design and firmware design approaches. (L2)
		C711.5	Explain the need of real time operating system for embedded system applications. (L2)
8th Semester			
4BHS801	PROFESSIONA L ETHICS FOR ENGINEERS	C801.1	Describe the Moral Values and Ethics. (L1)
		C801.2	Explain the Engineering Ethics. (L1)
		C801.3	Discuss the Responsibility as Engineers. (L2)
		C801.4	Examine the Safety and Risk. (L2)
		C801.5	Predict the working Ethics for Engineers. (L2)
4BCS802	SOFTWARE TESTING	C802.1	Apply software testing knowledge and engineering methods. (L3)
		C802.2	Identify various software testing problems, and solve the problems. (L2)
		C802.3	Design and conduct various levels of software testing for a software project. (L4)
		C802.4	Apply various communication methods and ethical skills in practice-oriented software testing projects. (L3)
		C802.5	Analyze the needs of software test automation and develop a test tool to support test automation. (L2)
		C803.1	Apply concepts of RNN and LSTM. (L3)
			Demonstrate concepts of Self-organizing maps in real-world

		C803.2	applications. (L3)
		C803.3	Illustrate Problems through pre trained model such as auto-encoders. (L3)
	DEEP LEARNING	C803.4	Interpret about Boltzmann machines and its applications. (L3)
4BCS803		C803.5	Apply the concept of GANs and know its applications. (L4)
		C804.1	Explain the concept of IoT. (L2)
		C804.2	Analyze various protocols for IoT. (L2)
		C804.3	Design a PoC of an IoT system using Rasperry Pi/Arduino. (L4)
	INTERNET OF THINGS	C804.4	Apply data analytics and use cloud offerings related to IoT. (L3)
4BCS804		C804.5	Analyze applications of IoT in real time scenario. (L2)
		C805.1	Compare the project built with other possible existing solutions to come to a conclusion about its feasibility and reliability. (L4)
		C805.2	Utilize proper project management techniques and planning methods to produce cost effective projects (L3)
		C805.3	Recommend the need to implement the project with supporting justification and possible areas to improve it and Compile a clear report containing the step by step process of building the project that includes all calculations, analysis and fabrication methods involved. (L5)
		C805.4	Build the real world implementation of the design that will realize the objectives of the prototype/ design. (L6)
	CAPSTONE PROJECT – BUILD	C805.5	Demonstrate working in groups taking leadership role and communicating effectively. (L2)
4BCS805			
		C806.1	Identify fundamental image processing techniques required for computer vision. (L1)
		C806.2	Represent chain codes and other region descriptors, Hough Transform for line, circle, and ellipse detections, 3D vision techniques. (L2)
		C806.3	Illustrate boundary tracking techniques. (L5)
	COMPUTER VISION	C806.4	Analyze and Implement motion related techniques. (L4)
4BCS851		C806.5	Construct applications using computer vision techniques. (L3)
		C807.1	Analyze the natural language text. (L4)
		C807.2	Create the natural language. (L6)
		C807.3	Analyze Text mining. (L4)
	NATURAL LANGUAGE PROCESSING	C807.4	Evaluation of Self Explanation (L2)
4BCS852		C807.5	Apply information retrieval techniques. (L3)
		C808.1	Explain the concepts of Data mining and its issues. (L1)
		C808.2	Analyze and apply association rule mining techniques. (L3)
		C808.3	Analyze various classification algorithms. (L2)
		C808.4	Elaborate the clustering algorithms. (L3)
4BCS853	DATA MINING	C808.5	Explain various density based methods. (L1)
		C809.1	Explain the fundamentals of Digital forensics. (L2)
		C809.2	Illustrate computer forensic techniques to identify the digital forensics associated with criminal activities. (L2)
		C809.3	Apply forensic analysis tools to recover important evidence for identifying computer crime. (L3)
	DIGITAL	C809.4	Explain Computer Crime and Criminals and Liturgical Procedures. (L2)
4BCS854	FORENSICS	C809.5	Analyze laws and ethics involved in cybercrime. (L4)
		C810.1	Explain the models of distributed computing. (L2)
		C810.2	Analyze distributed shared memory models. (L4)
		C810.3	Design and Implement distributed file systems. (L6)
		C810.4	Build the distributed algorithms for handling deadlocks. (L3)
	DISTRIBUTED COMPUTING	C810.5	Importance of the inherent difficulties that arise due to distributedness of computing resources. (L5)
4BCS8555			

SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of Computer Science Engineering

COs

2019 Batch

Course Outcomes

Course Code	Course	Course Outcomes(CO) Code	Course Outcomes
1st Semester			
4BMA101	Engineering Mathematics – I	C101.1	List nth order derivatives of different functions. (L1)
		C101.2	Demonstrate the use of partial derivatives. (L2)
		C101.3	Explain the concept of vector differentiation. (L2)
		C101.4	Classify the 1st order differential equation. (L2)
		C101.5	Apply the knowledge of matrices techniques. (L3)
4BCH102/ 202	ENGINEERING CHEMISTRY	C102.1	Illustrate the concept of electrochemical cell by writing balanced redox reactions. (L2)
		C102.2	Explain the mechanism of corrosion in metals by framing stoichiometric chemical reaction. (L2)
		C102.3	Explain the polymer composites for photocatalytic and photovoltaic applications by examining the photogenerated charged carrier dynamics. (L2)
		C102.4	Classify different types of carbon forms and its applications by interpreting their structural properties. (L2)
		C102.5	Understand the synthesis of nanomaterials by determining appropriate solution method. (L2)
4BME103/ 203	COMPUTER AIDED ENGINEERING DRAWING AND RAPID PROTOTYPING	C103.1	Draw orthographic projections (TV, FV and SV) of points, straight lines, surfaces using instruments and CAD software (L1)
		C103.2	technique. (L3)
		C103.3	surfaces of solid geometry (L3)
		C103.4	Using isometric projections of combination of solids build model (L3)
		C103.5	Create models using rapid prototyping and laser cutting (L6)
4BEC105/ 205	MAKING WITH ELECTRONICS	C104.1	Associate basic engineering principles with operations of electronic components, equipment and circuits at an elementary level. (L2)

		C104.2	Identify and analyze basic electronic components and concepts using working models and experiments. (L1, L4)
		C104.3	Apply concepts learnt to design basic circuits to achieve desired specific outputs. (L3)
		C104.4	Develop in teams, simple interactive projects using Arduino that use the knowledge of circuit design and electronic components gained in the course. (L4)
		C104.5	Develop a Project with knowledge of module from Electronics. (L4)
	ENVIRONMEN	C105.1	Outline the expected consequences of continuous environment degradation in the society by relevant data analysis. (L2)
		C105.2	Demonstrate a rationale for climate change adaptation and mitigation by proposing appropriate actions in key sectors. (L2)
		C105.3	Explain the key issues under negotiation by summarizing the international climate change legal and policy framework. (L2)

4BHS105/ 205	T AND SUSTAINABILI TY	C105.4	Demonstrate knowledge of environment sustainability by analyzing relevant data about industrial impact on environment. (L2)
4BHS106	PROFESSIONA L COMMUNICA TION – I	C106.1	Identify and predict accurately use of grammar, punctuation and vocabulary in different types of communication. (L2)
		C106.2	Apply basic skills of paraphrasing and rewriting by taking and making effective notes. (L3)
		C106.3	Compose engaging creative writing pieces through techniques of speculation and prediction. (L6)
		C106.4	Write compelling emails using appropriate writing etiquette and rules of grammar. (L3)
		C106.5	Write compelling formal and informal letters. (L3)
	INDUCTION PROGRAM	C107.1	The groups which are formed should function as mentor – Mentee network.
		C107.2	A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc.
		C107.3	For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.
		C107.4	Such a group should remain for the entire 4 – 5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/ discipline.
2nd Semster			
4BMA201	ENGINEERING MATHEMATI CS – II	C201.1	Understand discrete and continuous probability distributions to resolve various engineering problems. [L2]
		C201.2	Apply the method of least squares to estimate the parameters of a regression model. [L3]
		C201.3	Implement Test of Hypothesis for a population parameter for small sample and large sample cases. [L3]
		C201.4	Recognizing Complex Number System, Elementary complex functions and analytic functions. [L1]
		C201.5	Interpret Cauchy integral formula and Cauchy Residue theorem to solve the complex integration. [L2]
4BPH122/ 222	ENGINEERING PHYSICS FOR CSE and IT	C202.1	Explain matter waves, Schrodinger's time independent wave equation and various features of wave function. [L1]
		C202.2	Describe applications of Schrodinger time independent wave equation using elementary problems such as infinite potential well, finite potential and potential barrier. [L2]
		C202.3	Explain drift and diffusion of charge carriers in semiconductor physics. [L2]
		C202.4	Describe I-V characteristics of PN junction diode and BJT. [L1]
		C202.5	Explain the features of superconductivity and its applications. [L2]
		C202.6	Describe the role of various measuring tools for performing experiments. [L1]
		C202.7	Explain the experimental setup, observed measurements and corresponding results using appropriate physical quantities and theoretical formulae. [L1]
		C203.1	Analyze electrical circuits by relevant Laws in DC circuits. (L2)
		C203.2	Demonstrate the knowledge of single phase and three-phase power generation by using the phasor diagrams. (L2)
		C203.3	Select suitable transformer for a given application by considering its design parameters. (L1)

		C203.4	Describe the working principle of DC Machine, generators and motors (L2)
4BEE103/ 203	BASIC ELECTRICAL ENGINEERING	C203.5	Illustrate the concept of rotating magnetic field and applications (L1)
4BME104/ 204	ENGINEERING WORKSHOP PRACTICE	C204.1	Select appropriate hand and power tools, machines, equipment and materials and demonstrate their correct use for simple making tasks (L3)
		C204.2	Creating new models with the help of scrap materials. (L6)
		C204.3	Demonstrate sheet metal model using development techniques, adhesives and fasteners. (L3)
		C204.4	Demonstrate welding technology for model making. (L3)
4BCS105/ 205	PROGRAMMI NG FOR PROBLEM SOLVING	C205.1	Explain the basic constructs of C language. (L2)
		C205.2	Execute, compile and debug programs in C language. (L5)
		C205.3	Implement programs involving user-defined data types, decision structures, loops, functions, pointers, structures and union , enumeration, file handling and pre-processor directives in C. (L3)
		C205.4	Given a computational problem, identify and abstract the programming task involved. (L3)
		C205.5	Develop an application using C programming to solve real-life problem. (L6)
4BHS206	PROFESSIONA L COMMUNICA TION – II	C206.1	Enhance reading comprehension, writing, listening and speaking skills needed to effective communication (L3)
		C206.2	Present effectively through various modes of presentation (L3)
		C206.3	Apply skills of socializing and networking in day to day professional communication. (L3)
		C206.4	Express ideas opinions and to participate in group discussion. (L2)
		C206.5	Understand the cultural sensitivity in communication and use it effectively. (L2)
4BHS107/ 207	MODERN HISTORY OF ENGINEERING	C207.1	Formulate original thought, opinions and insights on engineering by critically analyzing the relationship between Engineering and Society, Environment, Philosophy, Economics and Polity by considering their positive and negative impact on each other (L5)
		C207.2	Compare engineering innovations/ innovators from different periods of history by explaining their historical significance. (L2)
		C207.3	Explain the value and importance of professional and ethical responsibility in the engineering profession by analyzing impact of engineering on the world. (L2)
3rd Semester			
4BCS301	DISCRETE MATHEMATI CAL STRUCTURES	C301.1	Apply the propositional and predicate logic in symbolic representations and validity tests. (L3)
		C301.2	Interpret the relations and functions in constructing the applications of Information Science. (L2)
		C301.3	Demonstrate the knowledge of recurrence relation by solving relevant mathematical problems. (L2)
		C301.4	Demonstrate the properties of integers by using Mathematical induction. (L2)
		C301.5	Analyze the message coding, message transmission error detection and correction using group theory. (L3)
		C302.1	Demonstrate the working principles of BJT and FET. (L2)
		C302.2	Construct and realize Logic gates using transistors. (L3)
		C302.3	Demonstrate the knowledge of Karnaugh maps by simplifying the algebraic equations and design the combinational circuits. (L2)
		C302.4	Design sequential Logic circuits and verify them by implementing them in hardware. (L2).

4BCS302	ANALOG AND DIGITAL ELECTRONICS	C302.5	Demonstrate the knowledge on VHDL by realizing combinational and sequential circuits and also develop Finite state machine. (L2)
4BCS303	DATA STRUCTURES USING C	C303.1	Explain different concepts C programming. (L2)
		C303.2	Apply the programming concepts in C for problem solving. (L3)
		C303.3	Explain the concepts of various data structures. (L2)
		C303.4	Illustrate the applications of data structures. (L2)
		C303.5	Develop a solutions to problem using appropriate data structure. (L3)
4BCS304	COMPUTER ORGANIZATION AND ARCHITECTURE	C304.1	Illustrate the various functional units of digital computers (L2)
		C304.2	Illustrate different concepts of CPU (L2)
		C304.3	Outline instruction execution using pipeline (L2)
		C304.4	Apply various hardware software concepts on instructions to exploit ILP (L3)
		C304.5	Explain Cache optimization techniques to improve system performance (L2)
4BCS305	PROGRAMMING WITH PYTHON	C305.1	Explain the syntax and semantics of python programming language and interpret the concepts of object oriented programming. (L2)
		C305.2	Create python programs using core data structures. (L2)
		C305.3	Analyze various run-time exceptions and can handle those exceptions. (L4)
		C305.4	Apply python packages in solving real-time problems. (L3)
		C305.5	Understand and apply visualization techniques. (L2)
4BHS306	PROFESSIONAL COMMUNICATION – III	C306.1	Present effectively with an understanding of various aspects of presentation. (L3)
		C306.2	Develop persuasive proposals by incorporating fundamental writing techniques at an intermediate level. (L3)
		C306.3	Develop effective reports by incorporating fundamental writing techniques at an intermediate level. (L3)
		C306.4	Construct references by using a referencing style that is appropriate to the type of academic writing. (L6)
		C306.5	Construct graphical representation of information by accurately interpreting and visualizing the given data. (L4)
4BHS307	PREPARE PROGRAM – I	C307.1	Apply number theory and speed calculation methods for the quick computation and manipulation of numbers. (L3)
		C307.2	Apply the theory of linear and quadratic equations using methods (indeterminate systems, equation comparisons etc) of equation formation to solve problems in several domains (e.g age problems). (L3)
		C307.3	Analyze distributive and arrangements puzzles to conclude logical solutions that adhere to the given parameters. (L4)
		C307.4	Demonstrate use of integral elements of public communication during a professional presentation. (L3)
		C307.5	Apply Basic English grammar rules (parts of speech, components and types of sentences) to identify errors in texts and construct correct sentences. (L3)
4BHS308	DESIGN THINKING – I	C308.1	Analysis user needs using structured techniques to discover unique product opportunity areas (L4)
		C308.2	Design solutions that tackle a given challenge by using iterative ideation techniques to generate alternative ideas, refine concepts and select the appropriate solution (L6)
		C308.3	Apply techniques of effective communication and collaboration to deliver convincing presentations, share and receive feedback, work effectively in teams and visualize their ideas (L3)
		C308.4	Demonstrate professionalism by adhering to deadlines, focusing on quality of work, maintaining detailed documentation and effectively using platforms for digital collaboration (L2)

4th semester			
4BCS401	ENGINEERING MATHEMATICS for CS and IT	C401.1	Explain the basic concepts of graph theory. [L2]
		C401.2	Solve problems involving vertex and edge colouring [L3]
		C401.3	Solve linear recurrence relations by recognizing homogeneity, linearity and constant coefficients. [L3]
		C401.4	Interpret and solve engineering problems using differential equation. [L2]
		C401.5	Solve linear and non-linear system of equations through numerical techniques. [L3]
4BCS402	DESIGN AND ANALYSIS OF ALGORITHM	C402.1	Identify various algorithm design techniques and strategies. (L1)
		C402.2	Represent various asymptotic performance of algorithm. (L2)
		C402.3	Illustrate the computational complexity of different algorithms. (L5)
		C402.4	Analyse and find the best algorithm for real time problem solving. (L4)
		C402.5	Construct best algorithm for real time problem solving. (L3)
4BCS403	SOFTWARE ENGINEERING	C403.1	Identify the various aspects of Software Product Engineering (L1)
		C403.2	Explain common Software Lifecycle processes including waterfall (linear), incremental approaches (such as Unified process), and agile approaches. (L2)
		C403.3	Prepare technical documentations and make presentations on various aspects of a software development project, including the technical aspects (architecture, design, quality assurance) as well as the managerial aspects (planning, scheduling, and delivery). (L3)
		C403.4	Explain the basics of software testing (L2)
		C403.5	Explain the various software cost estimation models (L2)
4BCS404	OBJECT ORIENTED PROGRAMMING USING JAVA	C404.1	Explain the Object Oriented Programming paradigm concepts. [L2]
		C404.2	Apply object oriented programming concepts for problem solving. [L3]
		C404.3	Explain the programming constructs in Java. [L2]
		C404.4	Explain the various packages, classes, interfaces in Java. [L2]
		C404.5	Develop applications in Java. [L3]
4BCS405	OPERATING SYSTEMS	C405.1	Explain different concepts for OS.(L2)
		C405.2	Demonstrate the concepts of process synchronization and deadlocks.(L2)
		C405.3	Illustrate memory management, secondary storage and Input /Output management concepts (L2)
		C405.4	Apply different operating system concepts for solving different scenarios. (L3)
		C405.5	Explain various protection and security issues in OS. (L2)
4BHS406	PROFESSIONAL COMMUNICATION – IV	C406.1	Plan, prepare and create business profile, portfolios, brochures, newsletters, banners and Posters. (L6)
		C406.2	Apply the different aspects technical written communication in writing. (L3)
		C406.3	Compose different types of business Correspondence. (L6)
		C406.4	Compose documents related to professional correspondence. (L6)
		C406.5	Demonstrate different effective strategies of presentation keeping in mind the importance of effective Listening. (L3)
		C407.1	Apply the concepts of ratio, proportions, percentages and averages to calculate class/set relationships (compound interest, weighted average etc) and complete component analysis (mixtures, distribution of profits in partnership etc). (L3)
		C407.2	Integrate concepts of logical connectives to breakdown linguistic components and solve puzzles that use logical connectors. (L4)

4BHS407	PREPARE PROGRAM – II	C407.3	Analyse data through the methods of selection and comparisons to prepare logical solutions to puzzles based on given parameters. (L3)
		C407.4	Recognize the meaning of words using the root-prefix-suffix structure and apply their extensive vocabulary in verbal and written contexts. (L1, L3)
		C407.5	Utilize techniques of public debate within a team by taking on different roles and articulating complex ideas in a persuasive manner. (L4)
4BHS408	DESIGN THINKING – II	C408.1	Analysis user needs using structured techniques to discover unique product opportunity areas (L4)
		C408.2	Design solutions that tackle a given challenge by using iterative ideation techniques to generate alternative ideas, refine concepts and select the appropriate solution (L6)
		C408.3	Apply techniques of effective communication and collaboration to deliver convincing presentations, share and receive feedback, work effectively in teams and visualize their ideas(L3)
		C408.4	Demonstrate professionalism by adhering to deadlines, focusing on quality of work, maintaining detailed documentation and effectively using platforms for digital collaboration (L2)
4BCS481	PYTHON PROGRAMMIN G	C409.1	Explain the syntax and semantics of python programming language and interpret the concepts of object oriented programming. (L2)
		C409.2	Create python programs using core data structures. (L2)
		C409.3	Analyze various run-time exceptions and can handle those exceptions. (L4)
		C409.4	Apply python packages in solving real-time problems. (L3)
		C409.5	Understand and apply visualization techniques. (L2)
4BCS482	COMPUTER SYSTEMS FOR ENGINEERS	C410.1	Explain the fundamental programming concepts. (L2)
		C410.2	Identify the various programming constructs to solve problems. (L3)
		C410.3	Explain the concepts of data visualization. (L2)
		C410.4	Explain System Development process. (L2)
		C410.5	Explain the various applications of systems and information technology in different domains. (L2)
4BCS483	INTRODUCTION TO SOFTWARE ENGINEERING	C411.1	Identify the various aspects of Software Product Engineering (L1)
		C411.2	Understand common Software Lifecycle processes including waterfall (linear), incremental approaches (such as Unified process), and agile approaches (L2)
		C411.3	Prepare technical documentations and make presentations on various aspects of a software development project, including the technical aspects (architecture, design, quality assurance) as well as the managerial aspects (planning, scheduling, and delivery) (L3)
		C411.4	Understand the basics of software testing (L2)
		C411.5	Explain the various software cost estimation models (L2)
5th Semester			
4BHS5A1/ 6A1	BUSINESS MANAGEMEN T FOR ENGINEERS	C501.1	Demonstrate the concepts related to entrepreneurship issues in business ideas. (L3)
		C501.2	Independently analyse the factors influencing the practice of management in different contexts. (L3)
		C501.3	Develop suitable economic strategy regarding common business problems. (L3)
		C501.4	Analyse the marketing strategy for common engineering business problems. (L4)
		C501.5	Illustrate the leadership qualities in the operation of a new venture. (L4)

4BCS504	MICROPROCESSORS	C502.1	Explain architecture and addressing modes of 8086. (L2)
		C502.2	Analyze the instruction set of 8086. (L2)
		C502.3	Write assembly language programs for 8086. (L4)
		C502.4	Explain Stacks and Interrupts in 8086. (L2)
		C502.5	Analyze bus configuration and interfacing of 8086. (L2)
4BCS503	DATABASE MANAGEMENT SYSTEMS	C503.1	Explain the fundamental concepts of a database management system. (L2)
		C503.2	Develop the logical design of the database using data modelling concepts. (L3)
		C503.3	Explain SQL programming constructs and relational model concepts. (L2)
		C503.4	Explain the concepts of transaction processing, concurrency control and recovery. (L2)
		C503.5	Make use of SQL to solve wide range of Database problems. (L3)
4BCS502	DATA COMMUNICATION AND COMPUTER NETWORKS	C504.1	Outline basic concepts in data communications, OSI and TCP/IP Protocol Stack. (L2)
		C504.2	Understand the transfer of data from source to the destination using different protocols and addressing. (L2)
		C504.3	Summarize the functions of Application layer protocols and how to meet the QoS requirements in networking. (L2)
		C504.4	Identify the limits and importance of compression, encoding, sampling, quantization methods. (L3)
		C504.5	Demonstrate how the communication is achieved securely without using any kind of connection. (L2)
4BCS505	FORMAL LANGUAGE AND AUTOMATA THEORY	C505.1	Explain the concepts in automata theory and formal languages and also apply finite state machines for modeling and solving computing problems. (L3)
		C505.2	Explain and implement the concepts of regular languages and context-free languages for solving problems. (L3)
		C505.3	Construct context free grammars, Push down Automata and explain the mechanism in it. (L3)
		C505.4	Describe the Properties of Context-Free Languages and explain the concepts in Turing Machine. (L2)
		C505.5	Explain decidability and intractability of computational problems. (L2)
4BHS506	PROFESSIONAL COMMUNICATION – V	C506.1	Compose Abstract and Literature Review as parts of academic writing (L5)
		C506.2	Prepare agenda, Minutes and Memos in specific business set up (L5)
		C506.3	Apply skills of argumentation using various techniques of arguments and deliberation. (L3)
		C506.4	Exhibit basics of interview etiquette in a given professional set up (L3).
		C506.5	Plan and prepare presentation using media and advertisements (L5)
		C507.1	Students will use the concepts of work-time-efficiency and distance- time-speed to solve problems related to the measurement of effort or performance. (L3)
		C507.2	Students will analyze geometric shapes and use mensuration formulas to mathematically measure 2D and 3D solids. (L4)

4BME507	PREPARE PROGRAM – III	C507.3	Students will illustrate their conceptual knowledge of blood relationships and direction sense through the creation of schematic diagrams and solving related problems. (L3)
		C507.4	Students will apply the concepts of input-output, series, as well as coding and decoding to discern specific patterns (finding the odd term, types of codes etc) from given data to solve problems.(L3)
		C507.5	Students will utilize verbal reasoning logic to solve tasks based on verbal data (para-completion, para- jumbles etc). (L4)
		C507.6	Students will demonstrate their reading and comprehension abilities by understanding a variety of writing styles and differentiating between close interpretations of text. (L3)
4BCS508	MINI PROJECT – I	C508.1	Conduct a survey of several available literature in the preferred field of study. (L5)
		C508.2	Demonstrate practical knowledge within the chosen area of technology for project development. (L2)
		C508.3	Analyze the problem requirements and arrive at workable design solutions. (L4)
		C508.4	Compare and contrast the several existing solutions for the attempted problem. (L5)
		C508.5	Summarize the report and present the findings of the study conducted in the preferred domain. (L2)
4BCS511	DATA MINING	C509.1	Explain the concepts of Data mining and its issues. (L1)
		C509.2	Analyze and apply association rule mining techniques. (L3)
		C509.3	Analyze various classification algorithms. (L2)
		C509.4	Elaborate the clustering algorithms. (L3)
		C509.5	Explain various density based methods. (L1)
4BCS512	CLOUD COMPUTING	C510.1	Explain main concepts, key technologies, strengths and limitations of cloud computing. (L2)
		C510.2	Explain the cloud enabling technologies that help in the development of cloud. (L2)
		C510.3	Develop the ability to use the architecture of compute and storage cloud, service and delivery models. (L3)
		C510.4	Explain core issues of cloud computing such as resource management and security. (L2)
		C510.5	Choose the appropriate technologies, algorithms and approaches for implementation and use of cloud. (L3)
4BCS513	DATA VISUALIZATION	C511.1	Explain the basic concepts of Data Visualization. (L2)
		C511.2	Analyze the basic visualization tools to understand the data. (L4)
		C511.3	Apply specialized visualization tools to make effective decisions. (L3)
		C511.4	Illustrate the advanced visualization tools. (L2)
		C511.5	Analyze geospatial data using visualization tools. (L4)
6th Semester			
4BHS6A1/ 5A1	OF GLOBALIZATION AND SUSTAINABLE DEVELOPMENT	C601.1	Demonstrate understanding of globalization process with emphasis on inter-dependence of communities and societies. (L1)
		C601.2	Analyse the critical issues in social development in the given context. (L2)
		C601.3	Develop technological interventions for social and community development. (L3)
	INFORMATION AND	C602.1	Identify fundamental notions of system security, threats, vulnerabilities, attacks and countermeasures. (L3)
		C602.2	Explain the various concepts of information network security. (L2)
		C602.3	Illustrate key distribution, key management issues and different cryptographic standards and certificates. (L2)
		C602.4	Explain the concepts of authentication, cyber law, web security and cyber ethics. (L2)

4BCS602	NETWORK SECURITY	C602.5	Develop various network algorithms and simulate wired/wireless networks to evaluate different network parameters. (L3)
4BCS603	MOBILE AAPLICATION DEVELOPMENT	C603.1	Explain the fundamental concepts of mobile application development. [L2]
		C603.2	Design responsive user interfaces that work across a wide range of devices. [L6]
		C603.3	Demonstrate the knowledge of data persistence in mobile applications. [L2]
		C603.4	Outline networking and web services concepts in mobile applications. [L2]
		C603.5	Apply the steps involved in publishing mobile application to share with the world. [L3]
4BCS604	COMPILER DESIGN	C604.1	Explain the concepts in different phases of compilation with compile time error handling. (L2)
		C604.2	Compare and explain top down and bottom up parsers, and develop appropriate parser to produce parse treerepresentation of the input. (L3)
		C604.3	Illustrate syntax-directed translation schemes for a given context free grammar and explain the various concepts in run-time environments. (L2)
		C604.4	Explain the various concepts in intermediate code generation and interpret for statements in high level language. (L2)
		C604.5	Apply optimization techniques to intermediate code and construct machine code for high level language program. (L3)
4BCS502	ARTIFICIAL INTELLIGENCE	C605.1	Elucidate the basic concepts of Artificial Intelligence. (L2)
		C605.2	Analyse Artificial Intelligence techniques, such as search algorithms, for problem solving. (L4)
		C605.3	Apply techniques of Knowledge Representation and Planning. (L3)
		C605.4	Apply knowledge of reasoning in the presence of incomplete or uncertain information. (L3)
		C605.5	Explain different forms of Learning. (L2)
4BHS606	PROFESSIONAL COMMUNICATION – VI	C606.1	Demonstrate the advanced skills of presentation. (L3)
		C606.2	Compose Technical Documents following proper format and style (L6)
		C606.3	Evaluate cases pertaining to a specific domain and recommend innovative suggestion/s to the case. (L4)
		C606.4	Apply the registers of technical English in oral and written mode of communication.(L3)
		C606.5	Collaborate and express themselves in an Interview round. (L6)
		C607.1	Students will infer the concepts of permutation, combination, and probability from a given set to solve problems of various arrangements (circular, linear etc) and criteria (expected value, biased dice etc). (L4)
		C607.2	Students will apply concepts from statistics (mean, median etc) and progressions (AP, GP, HP) to analyze groups of numbers on the mentioned parameters. (L3)
		C607.3	Students will use indices and surds to solve problems related to representation of numbers (large integers, irrational roots etc). (L3)
		C607.4	Students will examine four types of logical statements to solve puzzles based on syllogisms. (L4)

4BME607	PREPARE PROGRAM – IV	C607.5	Students will apply the concepts of venn diagrams and cubes to solve puzzles using set theory, breaking-building rules etc . (L3)
		C607.6	Students will be able to combine logic with their knowledge of advanced English vocabulary and grammar to solve verbal data tasks(e.g. para-completion etc) and articulate their ideas. (L4)
4BCS608	MINI PROJECT – II	C608.1	Demonstrate practical knowledge within the chosen area of technology for project development. (L2)
		C608.2	Identify, analyze, formulate and handle computer/IT projects with a comprehensive and systematic approach to give workable design solutions (L4)
		C608.3	Conduct a survey of several available literature in the preferred field of study and Compare the several existing solutions for the attempted problem. (L5)
		C608.4	Propose innovative solution for the development of components, processes or technologies in CS/IT field. (L6)
		C608.5	To report and present the findings of the study conducted in the preferred domain as well develop effective communication skills for presentation of project related activities. (L3)
4BCS621	No-SQL DATABASES	C609.1	Elaborate the fundamental concepts of No-SQL databases. (L2)
		C609.2	Analyze the features and use cases of key-value databases. (L3)
		C609.3	Explain the features and challenges pertaining to document databases. (L2)
		C609.4	Illustrate the characteristics of column oriented No-SQL databases. (L4)
		C609.5	Describe the design and use cases of graph databases. (L3)
4BCS622	STORAGE AREA NETWORKS	C610.1	Explain basic concepts for Storage systems (L2)
		C610.2	Apply the concepts of storage networking technologies. (L3)
		C610.3	Explain the concepts in Backup, Archive and Replication. (L2)
		C610.4	Analyse the concepts of cloud computing and virtualization. (L4)
		C610.5	Explain various concepts in managing and securing storage infrastructure (L2)
4BCS624	PARALLEL COMPUTING	C611.1	Explain the scalability and clustering issues in parallel computing. (L2)
		C611.2	Infer the various technologies enabling parallel computing. (L2)
		C611.3	Explain the different types of interconnection networks. (L2)
		C611.4	Analyze different parallel programming models for real time problems. (L4)
		C611.5	Explain the software support needed for shared memory programming. (L2)
7th Semester			
4BCS701	MACHINE LEARNING	C701.1	Explain basic concepts of Machine Learning. (L2)
		C701.2	Analyse Data to perform Exploratory Data Analysis. (L4)
		C701.3	Implement Supervised Machine Learning algorithms to solve problems. (L6)
		C701.4	Implement Un-Supervised Machine Learning algorithm to analyse data. (L6)
		C701.5	Evaluate models to perform Model Selection. (L5)
	DATA ANALYSIS	C702.1	Explain the syntax and semantics of Python Programming language. (L2)
		C702.2	Demonstrate proficiency in handling Strings and File systems. (L2)
		C702.3	Apply python packages in solving real-time problems. (L3)
		C702.4	Build Web Services and introduction to Network and Database Programming in Python. (L3)

4BCS702	USING PYTHON	C702.5	Interpret Data Visualization concepts in Python. (L2)
4BHS704	PREPARE PROGRAM – V	C704.1	Students will be able to apply number theory concepts and formulas to solve problems of base system, remainder theorem etc. (L3)
		C704.2	Students will be able to categorize contradictions within the area of binary logic to solve problems using concepts of contradictions truth tellers, liars and alternators.
		C704.3	Students will be able to solve types of pattern recognition problems (fillers, calendar etc) by utilizing different functions that fit the given criteria. (L3)
		C704.4	Students will be able to analyze the sufficiency of data and interpret its specific components by solving problems using data reasoning and interpretation of its numerical and graphic representations. (L4)
		C704.5	Students will be able to make use of advanced arithmetic, algebra and mensuration techniques to solve a variety of problems using a range of concepts from partnership to permutation & combination. (L3)
		C704.6	Students will be able to apply written and verbal communication techniques by articulating themselves in the format of discussion, debate, interview, essay, letter etc. (L3)
4BCS705	CAPSTONE PROJECT – DESIGN	C705.1	Demonstrate engineering knowledge and its framework for its implementation in the project design as well work in groups taking leadership role and communicate effectively (L2)
		C705.2	Survey relevant literature in the chosen field of study that allows interrelation of design and research (L4)
		C705.3	Model a prototype/ concept design that exhibits the feasibility of the solution from cost, engineering and environmental aspects. (L3)
		C705.4	Justify the project design with a structured report that covers all the work carried out between framing the problem statement to the project design. (L5)
		C705.5	Design conceptual ideas that address the issues with respect to real world problems. (L6)
4BCS731	ETHICAL HACKING	C706.1	Describe the basics of the ethical hacking. (L2)
		C706.2	Describe the foot printing and scanning. (L2)
		C706.3	Demonstrate the techniques and countermeasures for system hacking. (L3)
		C706.4	Characterize the malware and their attacks. (L2)
		C706.5	Analyze and prevent the security attacks in different environments. (L4)
4BCS732	REAL TIME SYSTEMS	C707.1	Characterize real-time systems and describe their functions. (L2)
		C707.2	Analyze various Clock-Driven Scheduling approaches. (L3)
		C707.3	Apply formal methods to analyze and design a priority-driven scheduling of periodic tasks. (L4)
		C707.4	Compare the methods for scheduling aperiodic and sporadic jobs in priority-driven systems. (L3)
		C707.5	Analyze various resources and resource access control approaches. (L3)
4BCS733	QUANTUM COMPUTING	C708.1	Describe the framework of quantum computation
		C708.2	Explain the differences between classical computation and quantum computation
		C708.3	Explain the concept of quantum entanglement and quantum teleportation
		C708.4	Implement single cubic gates
		C708.5	Explain how quantum computation may be applied in future technologies

		C802.1	Apply software testing knowledge and engineering methods. (L3)
		C802.2	Identify various software testing problems, and solve the problems. (L2)
		C802.3	Design and conduct various levels of software testing for a software project. (L4)
		C802.4	Apply various communication methods and ethical skills in practice-oriented software testing projects. (L3)
4BCS802	SOFTWARE TESTING	C802.5	Analyze the needs of software test automation and develop a test tool to support test automation. (L2)
		C803.1	Apply concepts of RNN and LSTM. (L3)
		C803.2	Demonstrate concepts of Self-organizing maps in real-world applications. (L3)
		C803.3	Illustrate Problems through pre trained model such as auto-encoders. (L3)
	DEEP LEARNING	C803.4	Interpret about Boltzmann machines and its applications. (L3)
4BCS803		C803.5	Apply the concept of GANs and know its applications. (L4)
		C804.1	Explain the concept of IoT. (L2)
		C804.2	Analyze various protocols for IoT. (L2)
		C804.3	Design a PoC of an IoT system using Rasperry Pi/Arduino. (L4)
	INTERNET OF THINGS	C804.4	Apply data analytics and use cloud offerings related to IoT. (L3)
4BCS804		C804.5	Analyze applications of IoT in real time scenario. (L2)
		8th Semester	
		C801.1	Describe the Moral Values and Ethics. (L1)
		C801.2	Explain the Engineering Ethics. (L1)
	PROFESSIONA L	C801.3	Discuss the Responsibility as Engineers. (L2)
	ETHICS FOR	C801.4	Examine the Safety and Risk. (L2)
4BHS801	ENGINEERS	C801.5	Predict the working Ethics for Engineers. (L2)
		C802.1	Apply software testing knowledge and engineering methods. (L3)
		C802.2	Identify various software testing problems, and solve the problems. (L2)
		C802.3	Design and conduct various levels of software testing for a software project. (L4)
		C802.4	Apply various communication methods and ethical skills in practice-oriented software testing projects. (L3)
4BCS802	SOFTWARE TESTING	C802.5	Analyze the needs of software test automation and develop a test tool to support test automation. (L2)
		C803.1	Apply concepts of RNN and LSTM. (L3)
		C803.2	Demonstrate concepts of Self-organizing maps in real-world applications. (L3)
		C803.3	Illustrate Problems through pre trained model such as auto-encoders. (L3)
	DEEP LEARNING	C803.4	Interpret about Boltzmann machines and its applications. (L3)
4BCS803		C803.5	Apply the concept of GANs and know its applications. (L4)
		C804.1	Explain the concept of IoT. (L2)
		C804.2	Analyze various protocols for IoT. (L2)
		C804.3	Design a PoC of an IoT system using Rasperry Pi/Arduino. (L4)
	INTERNET OF THINGS	C804.4	Apply data analytics and use cloud offerings related to IoT. (L3)
4BCS804		C804.5	Analyze applications of IoT in real time scenario. (L2)
		C805.1	Compare the project built with other possible existing solutions to come to a conclusion about its feasibility and reliability. (L4)
		C805.2	Utilize proper project management techniques and planning methods to produce cost effective projects (L3)
		C805.3	Recommend the need to implement the project with supporting justification and possible areas to improve it and Compile a clear report containing the step by step process of building the project that includes all calculations, analysis and fabrication methods involved. (L5)

4BCS805	CAPSTONE PROJECT – BUILD	C805.4	Build the real world implementation of the design that will realize the objectives of the prototype/ design. (L6)
		C805.5	Demonstrate working in groups taking leadership role and communicating effectively. (L2)
4BCS851	COMPUTER VISION	C806.1	Identify fundamental image processing techniques required for computer vision. (L1)
		C806.2	Represent chain codes and other region descriptors, Hough Transform for line, circle, and ellipse detections, 3D vision techniques. (L2)
		C806.3	Illustrate boundary tracking techniques. (L5)
		C806.4	Analyze and Implement motion related techniques. (L4)
		C806.5	Construct applications using computer vision techniques. (L3)
4BCS852	NATURAL LANGUAGE PROCESSING	C807.1	Analyze the natural language text. (L4)
		C807.2	Create the natural language. (L6)
		C807.3	Analyze Text mining. (L4)
		C807.4	Evaluation of Self Explanation (L2)
		C807.5	Apply information retrieval techniques. (L3)
4BCS853	DATA MINING	C808.1	Explain the concepts of Data mining and its issues. (L1)
		C808.2	Analyze and apply association rule mining techniques. (L3)
		C808.3	Analyze various classification algorithms. (L2)
		C808.4	Elaborate the clustering algorithms. (L3)
		C808.5	Explain various density based methods. (L1)
4BCS854	DIGITAL FORENSICS	C809.1	Explain the fundamentals of Digital forensics. (L2)
		C809.2	Illustrate computer forensic techniques to identify the digital forensics associated with criminal activities. (L2)
		C809.3	Apply forensic analysis tools to recover important evidence for identifying computer crime. (L3)
		C809.4	Explain Computer Crime and Criminals and Liturgical Procedures. (L2)
		C809.5	Analyze laws and ethics involved in cybercrime. (L4)
4BCS8555	DISTRIBUTED COMPUTING	C810.1	Explain the models of distributed computing. (L2)
		C810.2	Analyze distributed shared memory models. (L4)
		C810.3	Design and Implement distributed file systems. (L6)
		C810.4	Build the distributed algorithms for handling deadlocks. (L3)
		C810.5	Importance of the inherent difficulties that arise due to distributedness of computing resources. (L5)
4BCS703	INTERNSHIP	C703.1	Demonstrate the skills in professional career goals. (L2)
		C703.2	Administer the insight into a possible career path of interest with organizational structure, roles and responsibilities. (L3)
		C703.3	Develop professional connections with leadership strategy and skill development. (L4)
		C703.4	Identify the professions to suit the interest as a result of this experience. (L3)
		C703.5	Conquer additional skills that will need to be developed to ensure career readiness such as new technology, developing a broader network, additional coursework. (L4)

SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of Computer Science Engineering

COs

2019 Batch

Course Outcomes

Course Code	Course	Course Outcomes(CO) Code	Course Outcomes
1st Semester			
4BMA101	Engineering Mathematics – I	C101.1	List nth order derivatives of different functions. (L1)
		C101.2	Demonstrate the use of partial derivatives. (L2)
		C101.3	Explain the concept of vector differentiation. (L2)
		C101.4	Classify the 1st order differential equation. (L2)
		C101.5	Apply the knowledge of matrices techniques. (L3)
4BCH102/ 202	ENGINEERING CHEMISTRY	C102.1	Illustrate the concept of electrochemical cell by writing balanced redox reactions. (L2)
		C102.2	Explain the mechanism of corrosion in metals by framing stoichiometric chemical reaction. (L2)
		C102.3	Explain the polymer composites for photocatalytic and photovoltaic applications by examining the photogenerated charged carrier dynamics. (L2)
		C102.4	Classify different types of carbon forms and its applications by interpreting their structural properties. (L2)
		C102.5	Understand the synthesis of nanomaterials by determining appropriate solution method. (L2)
4BME103/ 203	COMPUTER AIDED ENGINEERING DRAWING AND RAPID PROTOTYPING	C103.1	Draw orthographic projections (TV, FV and SV) of points, straight lines, surfaces using instruments and CAD software (L1)
		C103.2	technique. (L3)
		C103.3	surfaces of solid geometry (L3)
		C103.4	Using isometric projections of combination of solids build model (L3)
		C103.5	Create models using rapid prototyping and laser cutting (L6)
4BEC105/ 205	MAKING WITH ELECTRONICS	C104.1	Associate basic engineering principles with operations of electronic components, equipment and circuits at an elementary level. (L2)

		C104.2	Identify and analyze basic electronic components and concepts using working models and experiments. (L1, L4)
		C104.3	Apply concepts learnt to design basic circuits to achieve desired specific outputs. (L3)
		C104.4	Develop in teams, simple interactive projects using Arduino that use the knowledge of circuit design and electronic components gained in the course. (L4)
		C104.5	Develop a Project with knowledge of module from Electronics. (L4)
	ENVIRONMEN	C105.1	Outline the expected consequences of continuous environment degradation in the society by relevant data analysis. (L2)
		C105.2	Demonstrate a rationale for climate change adaptation and mitigation by proposing appropriate actions in key sectors. (L2)
		C105.3	Explain the key issues under negotiation by summarizing the international climate change legal and policy framework. (L2)

4BHS105/ 205	T AND SUSTAINABILI TY	C105.4	Demonstrate knowledge of environment sustainability by analyzing relevant data about industrial impact on environment. (L2)
4BHS106	PROFESSIONA L COMMUNICA TION – I	C106.1	Identify and predict accurately use of grammar, punctuation and vocabulary in different types of communication. (L2)
		C106.2	Apply basic skills of paraphrasing and rewriting by taking and making effective notes. (L3)
		C106.3	Compose engaging creative writing pieces through techniques of speculation and prediction. (L6)
		C106.4	Write compelling emails using appropriate writing etiquette and rules of grammar. (L3)
		C106.5	Write compelling formal and informal letters. (L3)
	INDUCTION PROGRAM	C107.1	The groups which are formed should function as mentor – Mentee network.
		C107.2	A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc.
		C107.3	For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.
		C107.4	Such a group should remain for the entire 4 – 5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/ discipline.
2nd Semster			
4BMA201	ENGINEERING MATHEMATI CS – II	C201.1	Understand discrete and continuous probability distributions to resolve various engineering problems. [L2]
		C201.2	Apply the method of least squares to estimate the parameters of a regression model. [L3]
		C201.3	Implement Test of Hypothesis for a population parameter for small sample and large sample cases. [L3]
		C201.4	Recognizing Complex Number System, Elementary complex functions and analytic functions. [L1]
		C201.5	Interpret Cauchy integral formula and Cauchy Residue theorem to solve the complex integration. [L2]
4BPH122/ 222	ENGINEERING PHYSICS FOR CSE and IT	C202.1	Explain matter waves, Schrodinger's time independent wave equation and various features of wave function. [L1]
		C202.2	Describe applications of Schrodinger time independent wave equation using elementary problems such as infinite potential well, finite potential and potential barrier. [L2]
		C202.3	Explain drift and diffusion of charge carriers in semiconductor physics. [L2]
		C202.4	Describe I-V characteristics of PN junction diode and BJT. [L1]
		C202.5	Explain the features of superconductivity and its applications. [L2]
		C202.6	Describe the role of various measuring tools for performing experiments. [L1]
		C202.7	Explain the experimental setup, observed measurements and corresponding results using appropriate physical quantities and theoretical formulae. [L1]
		C203.1	Analyze electrical circuits by relevant Laws in DC circuits. (L2)
		C203.2	Demonstrate the knowledge of single phase and three-phase power generation by using the phasor diagrams. (L2)
		C203.3	Select suitable transformer for a given application by considering its design parameters. (L1)

		C203.4	Describe the working principle of DC Machine, generators and motors (L2)
4BEE103/ 203	BASIC ELECTRICAL ENGINEERING	C203.5	Illustrate the concept of rotating magnetic field and applications (L1)
4BME104/ 204	ENGINEERING WORKSHOP PRACTICE	C204.1	Select appropriate hand and power tools, machines, equipment and materials and demonstrate their correct use for simple making tasks (L3)
		C204.2	Creating new models with the help of scrap materials. (L6)
		C204.3	Demonstrate sheet metal model using development techniques, adhesives and fasteners. (L3)
		C204.4	Demonstrate welding technology for model making. (L3)
4BCS105/ 205	PROGRAMMI NG FOR PROBLEM SOLVING	C205.1	Explain the basic constructs of C language. (L2)
		C205.2	Execute, compile and debug programs in C language. (L5)
		C205.3	Implement programs involving user-defined data types, decision structures, loops, functions, pointers, structures and union , enumeration, file handling and pre-processor directives in C. (L3)
		C205.4	Given a computational problem, identify and abstract the programming task involved. (L3)
		C205.5	Develop an application using C programming to solve real-life problem. (L6)
4BHS206	PROFESSIONA L COMMUNICA TION – II	C206.1	Enhance reading comprehension, writing, listening and speaking skills needed to effective communication (L3)
		C206.2	Present effectively through various modes of presentation (L3)
		C206.3	Apply skills of socializing and networking in day to day professional communication. (L3)
		C206.4	Express ideas opinions and to participate in group discussion. (L2)
		C206.5	Understand the cultural sensitivity in communication and use it effectively. (L2)
4BHS107/ 207	MODERN HISTORY OF ENGINEERING	C207.1	Formulate original thought, opinions and insights on engineering by critically analyzing the relationship between Engineering and Society, Environment, Philosophy, Economics and Polity by considering their positive and negative impact on each other (L5)
		C207.2	Compare engineering innovations/ innovators from different periods of history by explaining their historical significance. (L2)
		C207.3	Explain the value and importance of professional and ethical responsibility in the engineering profession by analyzing impact of engineering on the world. (L2)
3rd Semester			
4BCS301	DISCRETE MATHEMATI CAL STRUCTURES	C301.1	Apply the propositional and predicate logic in symbolic representations and validity tests. (L3)
		C301.2	Interpret the relations and functions in constructing the applications of Information Science. (L2)
		C301.3	Demonstrate the knowledge of recurrence relation by solving relevant mathematical problems. (L2)
		C301.4	Demonstrate the properties of integers by using Mathematical induction. (L2)
		C301.5	Analyze the message coding, message transmission error detection and correction using group theory. (L3)
		C302.1	Demonstrate the working principles of BJT and FET. (L2)
		C302.2	Construct and realize Logic gates using transistors. (L3)
		C302.3	Demonstrate the knowledge of Karnaugh maps by simplifying the algebraic equations and design the combinational circuits. (L2)
		C302.4	Design sequential Logic circuits and verify them by implementing them in hardware. (L2).

4BCS302	ANALOG AND DIGITAL ELECTRONICS	C302.5	Demonstrate the knowledge on VHDL by realizing combinational and sequential circuits and also develop Finite state machine. (L2)
4BCS303	DATA STRUCTURES USING C	C303.1	Explain different concepts C programming. (L2)
		C303.2	Apply the programming concepts in C for problem solving. (L3)
		C303.3	Explain the concepts of various data structures. (L2)
		C303.4	Illustrate the applications of data structures. (L2)
		C303.5	Develop a solutions to problem using appropriate data structure. (L3)
4BCS304	COMPUTER ORGANIZATION AND ARCHITECTURE	C304.1	Illustrate the various functional units of digital computers (L2)
		C304.2	Illustrate different concepts of CPU (L2)
		C304.3	Outline instruction execution using pipeline (L2)
		C304.4	Apply various hardware software concepts on instructions to exploit ILP (L3)
		C304.5	Explain Cache optimization techniques to improve system performance (L2)
4BCS305	PROGRAMMING WITH PYTHON	C305.1	Explain the syntax and semantics of python programming language and interpret the concepts of object oriented programming. (L2)
		C305.2	Create python programs using core data structures. (L2)
		C305.3	Analyze various run-time exceptions and can handle those exceptions. (L4)
		C305.4	Apply python packages in solving real-time problems. (L3)
		C305.5	Understand and apply visualization techniques. (L2)
4BHS306	PROFESSIONAL COMMUNICATION – III	C306.1	Present effectively with an understanding of various aspects of presentation. (L3)
		C306.2	Develop persuasive proposals by incorporating fundamental writing techniques at an intermediate level. (L3)
		C306.3	Develop effective reports by incorporating fundamental writing techniques at an intermediate level. (L3)
		C306.4	Construct references by using a referencing style that is appropriate to the type of academic writing. (L6)
		C306.5	Construct graphical representation of information by accurately interpreting and visualizing the given data. (L4)
4BHS307	PREPARE PROGRAM – I	C307.1	Apply number theory and speed calculation methods for the quick computation and manipulation of numbers. (L3)
		C307.2	Apply the theory of linear and quadratic equations using methods (indeterminate systems, equation comparisons etc) of equation formation to solve problems in several domains (e.g age problems). (L3)
		C307.3	Analyze distributive and arrangements puzzles to conclude logical solutions that adhere to the given parameters. (L4)
		C307.4	Demonstrate use of integral elements of public communication during a professional presentation. (L3)
		C307.5	Apply Basic English grammar rules (parts of speech, components and types of sentences) to identify errors in texts and construct correct sentences. (L3)
4BHS308	DESIGN THINKING – I	C308.1	Analysis user needs using structured techniques to discover unique product opportunity areas (L4)
		C308.2	Design solutions that tackle a given challenge by using iterative ideation techniques to generate alternative ideas, refine concepts and select the appropriate solution (L6)
		C308.3	Apply techniques of effective communication and collaboration to deliver convincing presentations, share and receive feedback, work effectively in teams and visualize their ideas (L3)
		C308.4	Demonstrate professionalism by adhering to deadlines, focusing on quality of work, maintaining detailed documentation and effectively using platforms for digital collaboration (L2)

4th semester			
4BCS401	ENGINEERING MATHEMATICS for CS and IT	C401.1	Explain the basic concepts of graph theory. [L2]
		C401.2	Solve problems involving vertex and edge colouring [L3]
		C401.3	Solve linear recurrence relations by recognizing homogeneity, linearity and constant coefficients. [L3]
		C401.4	Interpret and solve engineering problems using differential equation. [L2]
		C401.5	Solve linear and non-linear system of equations through numerical techniques. [L3]
4BCS402	DESIGN AND ANALYSIS OF ALGORITHM	C402.1	Identify various algorithm design techniques and strategies. (L1)
		C402.2	Represent various asymptotic performance of algorithm. (L2)
		C402.3	Illustrate the computational complexity of different algorithms. (L5)
		C402.4	Analyse and find the best algorithm for real time problem solving. (L4)
		C402.5	Construct best algorithm for real time problem solving. (L3)
4BCS403	SOFTWARE ENGINEERING	C403.1	Identify the various aspects of Software Product Engineering (L1)
		C403.2	Explain common Software Lifecycle processes including waterfall (linear), incremental approaches (such as Unified process), and agile approaches. (L2)
		C403.3	Prepare technical documentations and make presentations on various aspects of a software development project, including the technical aspects (architecture, design, quality assurance) as well as the managerial aspects (planning, scheduling, and delivery). (L3)
		C403.4	Explain the basics of software testing (L2)
		C403.5	Explain the various software cost estimation models (L2)
4BCS404	OBJECT ORIENTED PROGRAMMING USING JAVA	C404.1	Explain the Object Oriented Programming paradigm concepts. [L2]
		C404.2	Apply object oriented programming concepts for problem solving. [L3]
		C404.3	Explain the programming constructs in Java. [L2]
		C404.4	Explain the various packages, classes, interfaces in Java. [L2]
		C404.5	Develop applications in Java. [L3]
4BCS405	OPERATING SYSTEMS	C405.1	Explain different concepts for OS.(L2)
		C405.2	Demonstrate the concepts of process synchronization and deadlocks.(L2)
		C405.3	Illustrate memory management, secondary storage and Input /Output management concepts (L2)
		C405.4	Apply different operating system concepts for solving different scenarios. (L3)
		C405.5	Explain various protection and security issues in OS. (L2)
4BHS406	PROFESSIONAL COMMUNICATION – IV	C406.1	Plan, prepare and create business profile, portfolios, brochures, newsletters, banners and Posters. (L6)
		C406.2	Apply the different aspects technical written communication in writing. (L3)
		C406.3	Compose different types of business Correspondence. (L6)
		C406.4	Compose documents related to professional correspondence. (L6)
		C406.5	Demonstrate different effective strategies of presentation keeping in mind the importance of effective Listening. (L3)
		C407.1	Apply the concepts of ratio, proportions, percentages and averages to calculate class/set relationships (compound interest, weighted average etc) and complete component analysis (mixtures, distribution of profits in partnership etc). (L3)
		C407.2	Integrate concepts of logical connectives to breakdown linguistic components and solve puzzles that use logical connectors. (L4)

4BHS407	PREPARE PROGRAM – II	C407.3	Analyse data through the methods of selection and comparisons to prepare logical solutions to puzzles based on given parameters. (L3)
		C407.4	Recognize the meaning of words using the root-prefix-suffix structure and apply their extensive vocabulary in verbal and written contexts. (L1, L3)
		C407.5	Utilize techniques of public debate within a team by taking on different roles and articulating complex ideas in a persuasive manner. (L4)
4BHS408	DESIGN THINKING – II	C408.1	Analysis user needs using structured techniques to discover unique product opportunity areas (L4)
		C408.2	Design solutions that tackle a given challenge by using iterative ideation techniques to generate alternative ideas, refine concepts and select the appropriate solution (L6)
		C408.3	Apply techniques of effective communication and collaboration to deliver convincing presentations, share and receive feedback, work effectively in teams and visualize their ideas(L3)
		C408.4	Demonstrate professionalism by adhering to deadlines, focusing on quality of work, maintaining detailed documentation and effectively using platforms for digital collaboration (L2)
4BCS481	PYTHON PROGRAMMIN G	C409.1	Explain the syntax and semantics of python programming language and interpret the concepts of object oriented programming. (L2)
		C409.2	Create python programs using core data structures. (L2)
		C409.3	Analyze various run-time exceptions and can handle those exceptions. (L4)
		C409.4	Apply python packages in solving real-time problems. (L3)
		C409.5	Understand and apply visualization techniques. (L2)
4BCS482	COMPUTER SYSTEMS FOR ENGINEERS	C410.1	Explain the fundamental programming concepts. (L2)
		C410.2	Identify the various programming constructs to solve problems. (L3)
		C410.3	Explain the concepts of data visualization. (L2)
		C410.4	Explain System Development process. (L2)
		C410.5	Explain the various applications of systems and information technology in different domains. (L2)
4BCS483	INTRODUCTION TO SOFTWARE ENGINEERING	C411.1	Identify the various aspects of Software Product Engineering (L1)
		C411.2	Understand common Software Lifecycle processes including waterfall (linear), incremental approaches (such as Unified process), and agile approaches (L2)
		C411.3	Prepare technical documentations and make presentations on various aspects of a software development project, including the technical aspects (architecture, design, quality assurance) as well as the managerial aspects (planning, scheduling, and delivery) (L3)
		C411.4	Understand the basics of software testing (L2)
		C411.5	Explain the various software cost estimation models (L2)
5th Semester			
4BHS5A1/ 6A1	BUSINESS MANAGEMEN T FOR ENGINEERS	C501.1	Demonstrate the concepts related to entrepreneurship issues in business ideas. (L3)
		C501.2	Independently analyse the factors influencing the practice of management in different contexts. (L3)
		C501.3	Develop suitable economic strategy regarding common business problems. (L3)
		C501.4	Analyse the marketing strategy for common engineering business problems. (L4)
		C501.5	Illustrate the leadership qualities in the operation of a new venture. (L4)

4BCS504	MICROPROCESSORS	C502.1	Explain architecture and addressing modes of 8086. (L2)
		C502.2	Analyze the instruction set of 8086. (L2)
		C502.3	Write assembly language programs for 8086. (L4)
		C502.4	Explain Stacks and Interrupts in 8086. (L2)
		C502.5	Analyze bus configuration and interfacing of 8086. (L2)
4BCS503	DATABASE MANAGEMENT SYSTEMS	C503.1	Explain the fundamental concepts of a database management system. (L2)
		C503.2	Develop the logical design of the database using data modelling concepts. (L3)
		C503.3	Explain SQL programming constructs and relational model concepts. (L2)
		C503.4	Explain the concepts of transaction processing, concurrency control and recovery. (L2)
		C503.5	Make use of SQL to solve wide range of Database problems. (L3)
4BCS502	DATA COMMUNICATION AND COMPUTER NETWORKS	C504.1	Outline basic concepts in data communications, OSI and TCP/IP Protocol Stack. (L2)
		C504.2	Understand the transfer of data from source to the destination using different protocols and addressing. (L2)
		C504.3	Summarize the functions of Application layer protocols and how to meet the QoS requirements in networking. (L2)
		C504.4	Identify the limits and importance of compression, encoding, sampling, quantization methods. (L3)
		C504.5	Demonstrate how the communication is achieved securely without using any kind of connection. (L2)
4BCS505	FORMAL LANGUAGE AND AUTOMATA THEORY	C505.1	Explain the concepts in automata theory and formal languages and also apply finite state machines for modeling and solving computing problems. (L3)
		C505.2	Explain and implement the concepts of regular languages and context-free languages for solving problems. (L3)
		C505.3	Construct context free grammars, Push down Automata and explain the mechanism in it. (L3)
		C505.4	Describe the Properties of Context-Free Languages and explain the concepts in Turing Machine. (L2)
		C505.5	Explain decidability and intractability of computational problems. (L2)
4BHS506	PROFESSIONAL COMMUNICATION – V	C506.1	Compose Abstract and Literature Review as parts of academic writing (L5)
		C506.2	Prepare agenda, Minutes and Memos in specific business set up (L5)
		C506.3	Apply skills of argumentation using various techniques of arguments and deliberation. (L3)
		C506.4	Exhibit basics of interview etiquette in a given professional set up (L3).
		C506.5	Plan and prepare presentation using media and advertisements (L5)
		C507.1	Students will use the concepts of work-time-efficiency and distance- time-speed to solve problems related to the measurement of effort or performance. (L3)
		C507.2	Students will analyze geometric shapes and use mensuration formulas to mathematically measure 2D and 3D solids. (L4)

4BME507	PREPARE PROGRAM – III	C507.3	Students will illustrate their conceptual knowledge of blood relationships and direction sense through the creation of schematic diagrams and solving related problems. (L3)
		C507.4	Students will apply the concepts of input-output, series, as well as coding and decoding to discern specific patterns (finding the odd term, types of codes etc) from given data to solve problems.(L3)
		C507.5	Students will utilize verbal reasoning logic to solve tasks based on verbal data (para-completion, para- jumbles etc). (L4)
		C507.6	Students will demonstrate their reading and comprehension abilities by understanding a variety of writing styles and differentiating between close interpretations of text. (L3)
4BCS508	MINI PROJECT – I	C508.1	Conduct a survey of several available literature in the preferred field of study. (L5)
		C508.2	Demonstrate practical knowledge within the chosen area of technology for project development. (L2)
		C508.3	Analyze the problem requirements and arrive at workable design solutions. (L4)
		C508.4	Compare and contrast the several existing solutions for the attempted problem. (L5)
		C508.5	Summarize the report and present the findings of the study conducted in the preferred domain. (L2)
4BCS511	DATA MINING	C509.1	Explain the concepts of Data mining and its issues. (L1)
		C509.2	Analyze and apply association rule mining techniques. (L3)
		C509.3	Analyze various classification algorithms. (L2)
		C509.4	Elaborate the clustering algorithms. (L3)
		C509.5	Explain various density based methods. (L1)
4BCS512	CLOUD COMPUTING	C510.1	Explain main concepts, key technologies, strengths and limitations of cloud computing. (L2)
		C510.2	Explain the cloud enabling technologies that help in the development of cloud. (L2)
		C510.3	Develop the ability to use the architecture of compute and storage cloud, service and delivery models. (L3)
		C510.4	Explain core issues of cloud computing such as resource management and security. (L2)
		C510.5	Choose the appropriate technologies, algorithms and approaches for implementation and use of cloud. (L3)
4BCS513	DATA VISUALIZATION	C511.1	Explain the basic concepts of Data Visualization. (L2)
		C511.2	Analyze the basic visualization tools to understand the data. (L4)
		C511.3	Apply specialized visualization tools to make effective decisions. (L3)
		C511.4	Illustrate the advanced visualization tools. (L2)
		C511.5	Analyze geospatial data using visualization tools. (L4)
6th Semester			
4BHS6A1/ 5A1	OF GLOBALIZATION AND SUSTAINABLE DEVELOPMENT	C601.1	Demonstrate understanding of globalization process with emphasis on inter-dependence of communities and societies. (L1)
		C601.2	Analyse the critical issues in social development in the given context. (L2)
		C601.3	Develop technological interventions for social and community development. (L3)
	INFORMATION AND	C602.1	Identify fundamental notions of system security, threats, vulnerabilities, attacks and countermeasures. (L3)
		C602.2	Explain the various concepts of information network security. (L2)
		C602.3	Illustrate key distribution, key management issues and different cryptographic standards and certificates. (L2)
		C602.4	Explain the concepts of authentication, cyber law, web security and cyber ethics. (L2)

4BCS602	NETWORK SECURITY	C602.5	Develop various network algorithms and simulate wired/wireless networks to evaluate different network parameters. (L3)
4BCS603	MOBILE AAPLICATION DEVELOPMENT	C603.1	Explain the fundamental concepts of mobile application development. [L2]
		C603.2	Design responsive user interfaces that work across a wide range of devices. [L6]
		C603.3	Demonstrate the knowledge of data persistence in mobile applications. [L2]
		C603.4	Outline networking and web services concepts in mobile applications. [L2]
		C603.5	Apply the steps involved in publishing mobile application to share with the world. [L3]
4BCS604	COMPILER DESIGN	C604.1	Explain the concepts in different phases of compilation with compile time error handling. (L2)
		C604.2	Compare and explain top down and bottom up parsers, and develop appropriate parser to produce parse treerepresentation of the input. (L3)
		C604.3	Illustrate syntax-directed translation schemes for a given context free grammar and explain the various concepts in run-time environments. (L2)
		C604.4	Explain the various concepts in intermediate code generation and interpret for statements in high level language. (L2)
		C604.5	Apply optimization techniques to intermediate code and construct machine code for high level language program. (L3)
4BCS502	ARTIFICIAL INTELLIGENCE	C605.1	Elucidate the basic concepts of Artificial Intelligence. (L2)
		C605.2	Analyse Artificial Intelligence techniques, such as search algorithms, for problem solving. (L4)
		C605.3	Apply techniques of Knowledge Representation and Planning. (L3)
		C605.4	Apply knowledge of reasoning in the presence of incomplete or uncertain information. (L3)
		C605.5	Explain different forms of Learning. (L2)
4BHS606	PROFESSIONAL COMMUNICATION – VI	C606.1	Demonstrate the advanced skills of presentation. (L3)
		C606.2	Compose Technical Documents following proper format and style (L6)
		C606.3	Evaluate cases pertaining to a specific domain and recommend innovative suggestion/s to the case. (L4)
		C606.4	Apply the registers of technical English in oral and written mode of communication.(L3)
		C606.5	Collaborate and express themselves in an Interview round. (L6)
		C607.1	Students will infer the concepts of permutation, combination, and probability from a given set to solve problems of various arrangements (circular, linear etc) and criteria (expected value, biased dice etc). (L4)
		C607.2	Students will apply concepts from statistics (mean, median etc) and progressions (AP, GP, HP) to analyze groups of numbers on the mentioned parameters. (L3)
		C607.3	Students will use indices and surds to solve problems related to representation of numbers (large integers, irrational roots etc). (L3)
		C607.4	Students will examine four types of logical statements to solve puzzles based on syllogisms. (L4)

4BME607	PREPARE PROGRAM – IV	C607.5	Students will apply the concepts of venn diagrams and cubes to solve puzzles using set theory, breaking-building rules etc . (L3)
		C607.6	Students will be able to combine logic with their knowledge of advanced English vocabulary and grammar to solve verbal data tasks(e.g. para-completion etc) and articulate their ideas. (L4)
4BCS608	MINI PROJECT – II	C608.1	Demonstrate practical knowledge within the chosen area of technology for project development. (L2)
		C608.2	Identify, analyze, formulate and handle computer/IT projects with a comprehensive and systematic approach to give workable design solutions (L4)
		C608.3	Conduct a survey of several available literature in the preferred field of study and Compare the several existing solutions for the attempted problem. (L5)
		C608.4	Propose innovative solution for the development of components, processes or technologies in CS/IT field. (L6)
		C608.5	To report and present the findings of the study conducted in the preferred domain as well develop effective communication skills for presentation of project related activities. (L3)
4BCS621	No-SQL DATABASES	C609.1	Elaborate the fundamental concepts of No-SQL databases. (L2)
		C609.2	Analyze the features and use cases of key-value databases. (L3)
		C609.3	Explain the features and challenges pertaining to document databases. (L2)
		C609.4	Illustrate the characteristics of column oriented No-SQL databases. (L4)
		C609.5	Describe the design and use cases of graph databases. (L3)
4BCS622	STORAGE AREA NETWORKS	C610.1	Explain basic concepts for Storage systems (L2)
		C610.2	Apply the concepts of storage networking technologies. (L3)
		C610.3	Explain the concepts in Backup, Archive and Replication. (L2)
		C610.4	Analyse the concepts of cloud computing and virtualization. (L4)
		C610.5	Explain various concepts in managing and securing storage infrastructure (L2)
4BCS624	PARALLEL COMPUTING	C611.1	Explain the scalability and clustering issues in parallel computing. (L2)
		C611.2	Infer the various technologies enabling parallel computing. (L2)
		C611.3	Explain the different types of interconnection networks. (L2)
		C611.4	Analyze different parallel programming models for real time problems. (L4)
		C611.5	Explain the software support needed for shared memory programming. (L2)
7th Semester			
4BCS701	MACHINE LEARNING	C701.1	Explain basic concepts of Machine Learning. (L2)
		C701.2	Analyse Data to perform Exploratory Data Analysis. (L4)
		C701.3	Implement Supervised Machine Learning algorithms to solve problems. (L6)
		C701.4	Implement Un-Supervised Machine Learning algorithm to analyse data. (L6)
		C701.5	Evaluate models to perform Model Selection. (L5)
	DATA ANALYSIS	C702.1	Explain the syntax and semantics of Python Programming language. (L2)
		C702.2	Demonstrate proficiency in handling Strings and File systems. (L2)
		C702.3	Apply python packages in solving real-time problems. (L3)
		C702.4	Build Web Services and introduction to Network and Database Programming in Python. (L3)

4BCS702	USING PYTHON	C702.5	Interpret Data Visualization concepts in Python. (L2)
4BHS704	PREPARE PROGRAM – V	C704.1	Students will be able to apply number theory concepts and formulas to solve problems of base system, remainder theorem etc. (L3)
		C704.2	Students will be able to categorize contradictions within the area of binary logic to solve problems using concepts of contradictions truth tellers, liars and alternators.
		C704.3	Students will be able to solve types of pattern recognition problems (fillers, calendar etc) by utilizing different functions that fit the given criteria. (L3)
		C704.4	Students will be able to analyze the sufficiency of data and interpret its specific components by solving problems using data reasoning and interpretation of its numerical and graphic representations. (L4)
		C704.5	Students will be able to make use of advanced arithmetic, algebra and mensuration techniques to solve a variety of problems using a range of concepts from partnership to permutation & combination. (L3)
		C704.6	Students will be able to apply written and verbal communication techniques by articulating themselves in the format of discussion, debate, interview, essay, letter etc. (L3)
4BCS705	CAPSTONE PROJECT – DESIGN	C705.1	Demonstrate engineering knowledge and its framework for its implementation in the project design as well work in groups taking leadership role and communicate effectively (L2)
		C705.2	Survey relevant literature in the chosen field of study that allows interrelation of design and research (L4)
		C705.3	Model a prototype/ concept design that exhibits the feasibility of the solution from cost, engineering and environmental aspects. (L3)
		C705.4	Justify the project design with a structured report that covers all the work carried out between framing the problem statement to the project design. (L5)
		C705.5	Design conceptual ideas that address the issues with respect to real world problems. (L6)
4BCS731	ETHICAL HACKING	C706.1	Describe the basics of the ethical hacking. (L2)
		C706.2	Describe the foot printing and scanning. (L2)
		C706.3	Demonstrate the techniques and countermeasures for system hacking. (L3)
		C706.4	Characterize the malware and their attacks. (L2)
		C706.5	Analyze and prevent the security attacks in different environments. (L4)
4BCS732	REAL TIME SYSTEMS	C707.1	Characterize real-time systems and describe their functions. (L2)
		C707.2	Analyze various Clock-Driven Scheduling approaches. (L3)
		C707.3	Apply formal methods to analyze and design a priority-driven scheduling of periodic tasks. (L4)
		C707.4	Compare the methods for scheduling aperiodic and sporadic jobs in priority-driven systems. (L3)
		C707.5	Analyze various resources and resource access control approaches. (L3)
4BCS733	QUANTUM COMPUTING	C708.1	Describe the framework of quantum computation
		C708.2	Explain the differences between classical computation and quantum computation
		C708.3	Explain the concept of quantum entanglement and quantum teleportation
		C708.4	Implement single cubic gates
		C708.5	Explain how quantum computation may be applied in future technologies

		C802.1	Apply software testing knowledge and engineering methods. (L3)
		C802.2	Identify various software testing problems, and solve the problems. (L2)
		C802.3	Design and conduct various levels of software testing for a software project. (L4)
		C802.4	Apply various communication methods and ethical skills in practice-oriented software testing projects. (L3)
4BCS802	SOFTWARE TESTING	C802.5	Analyze the needs of software test automation and develop a test tool to support test automation. (L2)
		C803.1	Apply concepts of RNN and LSTM. (L3)
		C803.2	Demonstrate concepts of Self-organizing maps in real-world applications. (L3)
		C803.3	Illustrate Problems through pre trained model such as auto-encoders. (L3)
	DEEP LEARNING	C803.4	Interpret about Boltzmann machines and its applications. (L3)
4BCS803		C803.5	Apply the concept of GANs and know its applications. (L4)
		C804.1	Explain the concept of IoT. (L2)
		C804.2	Analyze various protocols for IoT. (L2)
		C804.3	Design a PoC of an IoT system using Rasperry Pi/Arduino. (L4)
	INTERNET OF THINGS	C804.4	Apply data analytics and use cloud offerings related to IoT. (L3)
4BCS804		C804.5	Analyze applications of IoT in real time scenario. (L2)
		8th Semester	
		C801.1	Describe the Moral Values and Ethics. (L1)
		C801.2	Explain the Engineering Ethics. (L1)
	PROFESSIONA L	C801.3	Discuss the Responsibility as Engineers. (L2)
	ETHICS FOR	C801.4	Examine the Safety and Risk. (L2)
4BHS801	ENGINEERS	C801.5	Predict the working Ethics for Engineers. (L2)
		C802.1	Apply software testing knowledge and engineering methods. (L3)
		C802.2	Identify various software testing problems, and solve the problems. (L2)
		C802.3	Design and conduct various levels of software testing for a software project. (L4)
		C802.4	Apply various communication methods and ethical skills in practice-oriented software testing projects. (L3)
4BCS802	SOFTWARE TESTING	C802.5	Analyze the needs of software test automation and develop a test tool to support test automation. (L2)
		C803.1	Apply concepts of RNN and LSTM. (L3)
		C803.2	Demonstrate concepts of Self-organizing maps in real-world applications. (L3)
		C803.3	Illustrate Problems through pre trained model such as auto-encoders. (L3)
	DEEP LEARNING	C803.4	Interpret about Boltzmann machines and its applications. (L3)
4BCS803		C803.5	Apply the concept of GANs and know its applications. (L4)
		C804.1	Explain the concept of IoT. (L2)
		C804.2	Analyze various protocols for IoT. (L2)
		C804.3	Design a PoC of an IoT system using Rasperry Pi/Arduino. (L4)
	INTERNET OF THINGS	C804.4	Apply data analytics and use cloud offerings related to IoT. (L3)
4BCS804		C804.5	Analyze applications of IoT in real time scenario. (L2)
		C805.1	Compare the project built with other possible existing solutions to come to a conclusion about its feasibility and reliability. (L4)
		C805.2	Utilize proper project management techniques and planning methods to produce cost effective projects (L3)
		C805.3	Recommend the need to implement the project with supporting justification and possible areas to improve it and Compile a clear report containing the step by step process of building the project that includes all calculations, analysis and fabrication methods involved. (L5)

4BCS805	CAPSTONE PROJECT – BUILD	C805.4	Build the real world implementation of the design that will realize the objectives of the prototype/ design. (L6)
		C805.5	Demonstrate working in groups taking leadership role and communicating effectively. (L2)
4BCS851	COMPUTER VISION	C806.1	Identify fundamental image processing techniques required for computer vision. (L1)
		C806.2	Represent chain codes and other region descriptors, Hough Transform for line, circle, and ellipse detections, 3D vision techniques. (L2)
		C806.3	Illustrate boundary tracking techniques. (L5)
		C806.4	Analyze and Implement motion related techniques. (L4)
		C806.5	Construct applications using computer vision techniques. (L3)
4BCS852	NATURAL LANGUAGE PROCESSING	C807.1	Analyze the natural language text. (L4)
		C807.2	Create the natural language. (L6)
		C807.3	Analyze Text mining. (L4)
		C807.4	Evaluation of Self Explanation (L2)
		C807.5	Apply information retrieval techniques. (L3)
4BCS853	DATA MINING	C808.1	Explain the concepts of Data mining and its issues. (L1)
		C808.2	Analyze and apply association rule mining techniques. (L3)
		C808.3	Analyze various classification algorithms. (L2)
		C808.4	Elaborate the clustering algorithms. (L3)
		C808.5	Explain various density based methods. (L1)
4BCS854	DIGITAL FORENSICS	C809.1	Explain the fundamentals of Digital forensics. (L2)
		C809.2	Illustrate computer forensic techniques to identify the digital forensics associated with criminal activities. (L2)
		C809.3	Apply forensic analysis tools to recover important evidence for identifying computer crime. (L3)
		C809.4	Explain Computer Crime and Criminals and Liturgical Procedures. (L2)
		C809.5	Analyze laws and ethics involved in cybercrime. (L4)
4BCS8555	DISTRIBUTED COMPUTING	C810.1	Explain the models of distributed computing. (L2)
		C810.2	Analyze distributed shared memory models. (L4)
		C810.3	Design and Implement distributed file systems. (L6)
		C810.4	Build the distributed algorithms for handling deadlocks. (L3)
		C810.5	Importance of the inherent difficulties that arise due to distributedness of computing resources. (L5)
4BCS703	INTERNSHIP	C703.1	Demonstrate the skills in professional career goals. (L2)
		C703.2	Administer the insight into a possible career path of interest with organizational structure, roles and responsibilities. (L3)
		C703.3	Develop professional connections with leadership strategy and skill development. (L4)
		C703.4	Identify the professions to suit the interest as a result of this experience. (L3)
		C703.5	Conquer additional skills that will need to be developed to ensure career readiness such as new technology, developing a broader network, additional coursework. (L4)

SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of Computer Science Engineering

Cos

2021 Batch

4MATH1011: ENGINEERING MATHEMATICS -I		
A. Course Framework		
Credits: 3-1-0-4		**Syllabus Version: 1**
Contact Hours / Week: 45+15	**Total Contact Hours: 60**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Apply the knowledge of calculus to analyse and approximate the functions. L3 **CO2:** Calculate rates of change of multivariate functions. L3 **CO3:** Solve multiple integrals for computing area and volume. L3 **CO4:** Make use of Gradient, divergence and curl for solving Engineering problems. L3 **CO5:** Use the concept vector integration to solve the flow problems. L3		

4PHY1011: ENGINEERING PHYSICS -I	
Course Framework	
Credits: 3-0-1-4	**Syllabus Version:1**
Course Outcomes:	
On successful completion of the course, students will be able to: CO1: Analyse the applications of quantum mechanics in technology. L4 CO2: Make use of Lasers and Optical fibres for different industrial applications. L3 CO3: Plot the I-V characteristics of photo-diode, LED, Zener diodes and solar cells. L3 CO4: Explain the use of Magnetic, Dielectric and Superconducting materials for different engineering applications. L2 CO5: Analyse the results obtained in different experiments. L4	

4ENEE1011: ELEMENTS OF ELECTRICAL ENGINEERING		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 45	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Analyze electrical circuits by relevant Laws in DC circuits. L4 **CO2:** Demonstrate the single phase and three-phase power generation by using the phasor diagrams. L3 **CO3:** Illustrate the construction and operation of DC machines and understand the concept of		

electrical wiring, protecting devices and earthing.	L3
CO4: Explain the construction and operation of AC machines.	L2

4CSGC1011: ELEMENTS OF COMPUTER ENGINEERING		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 45	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Demonstrate functioning of different sub-systems, OS and different types of OS. L3 **CO2:** Use different types of data structures, operations and algorithms. L3 **CO3:** Describe the fundamental elements of relational database management systems. L2 **CO4:** Comprehend the layered protocol model & Classification of networks. L3 **CO5:** Demonstrate need for Linux OS and Linux commands. L3		

4ENME1011: COMPUTER AIDED ENGINEERING DRAWING		
A. Course Framework		
Credits: 1-0-2-3		**Syllabus Version: 1**
Contact Hours / Week: 15+60	**Total Contact Hours: 75**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Illustrate competence in basics of orthographic projections of points, lines, planes and solids in three different views. L3 **CO2:** Apply the concepts of orthographic projections for simple objects. L3 **CO3:** Develop surfaces of solids of simple objects. **L3**		

II SEMESTER

4MATH1021: ENGINEERING MATHEMATICS II		
A. Course Framework		
Credits: 3-1-0-4		**Syllabus Version: 1**
Contact Hours / Week: 45+15	**Total Contact Hours: 60**	**Level: 100**
Course Outcomes:		

On successful completion of the course, students will be able to:	
CO1: Solve first order linear ordinary differential equations	L3
CO2: Solve higher order differential equations arising through physical processes.	L3
CO3: Construct a variety of partial differential equations and solve them.	L4
CO4: Use periodic signals to represent periodic functions in the form of Fourier series.	L3
CO5: Make use of matrix theory for solving system of linear equations	L3

4CHEM1011: ENGINEERING CHEMISTRY		
A. Course Framework		
Credits: 1-0-1-2		**Syllabus Version: 1.0**
Contact Hours / Week: 15+22	**Total Contact Hours: 37**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Explain the construction and working of Energy storage devices.		L2
CO2: Explain corrosion of metals, factors and prevention techniques.		L2
CO3: Explain the importance of the modern emerging field of nanotechnology.		L2
CO4: Use instruments which give quick and accurate results for material analysis.		L3
CO5: Carry out different types of titrations for estimation of concentration of an analyte.		L3

4ENCE1011: ELEMENTS OF ELECTRONICS ENGINEERING		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version:1**
Contact Hours / Week: 45	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Describe semiconductor devices and its applications		L2
CO2: Analyze the various circuits of BJT		L4
CO3: Employ op-amp in various circuits		L3
CO4: Analyze digital circuits		L4
CO5: Appreciate the importance of transducers and communication systems		L5

4EME1022 : ELEMENTS OF MECHANICAL ENGINEERING AND WORKSHOP		
A. Course Framework		
Credits: 2-0-1-3:		**Syllabus Version:2.0**
Contact Hours / Week: 30+30	**Total Contact Hours: 60**	**Level: 100**
Course Outcomes:		

On successful completion of the course, students will be able to:
CO1 Recognize the impact of energy sources on the environment and sustainability. L2
CO2 Explain the working principles of water, vapour and gas-powered systems. L2
CO3 Discuss the working principles of refrigeration systems and IC engines. L2
CO4 Compute various performance parameters of IC engines. L3
CO5 Demonstrate soldering, brazing and welding of sheet metal & welded joints. L2

4ENCV1011: ELEMENTS OF CIVIL ENGINEERING		
A. Course Framework		
Credits: 2-1-0-3:		**Syllabus Version: 1**
Contact Hours / Week: 30+15	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Explain the basics of Civil Engineering and related fields.		L2
CO2: Develop working models with the laws of mechanics.		L3
CO3: Analyze equilibrium of coplanar, concurrent and non-concurrent forces.		L4
CO4: Determine centroid and moment of inertia of simple geometric figures.		L3
CO5: Apply D'Alembert's principle in any specific application.		L3
PO: PO1/PO2/PO3/PO4	**PSO: PSO1**	

4CSPL1011: PROBLEM SOLVING USING PYTHON		
A. Course Framework		
Credits: 2-0-1-3		**Syllabus Version: 1**
Contact Hours / Week: 30+30	**Total Contact Hours:60**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Understand the basis of algorithm problem solving		L2
CO2: Read/Write simple simple python programs		L3
CO3: Develop python programs with conditionals and loops		L4
CO4: Use python functions and python data structures		L3
CO5: Read and write data from/to files in python programs		L3

III SEMESTER

4MATH2011-ENGINEERING MATHEMATICS-III

A. Course Framework		
Credits: 3-1-0-4		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 60**	**Level: 200**
Course Outcomes:		
CO1 Make use of C–R equations to form analytic functions L3 CO2 Explain the concept of conformal, bilinear transformations and contour integration L2 CO3 Apply Z-transforms for discrete functions. L3 CO4 Solve linear differential equations by Laplace transform method L3 CO5 Solve first and second order ordinary differential equation using single step and multistep numerical methods L3		

4MATH2031 : Discrete Mathematical Structures		
A. Course Framework		
Credits: 2-1-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 200**
Course Outcomes:		
CO1.Explain the propositional, predicate logic and truth table by evaluating correctness of argument.-L2 CO2.Demonstrate the properties of integers by using Mathematical induction.-L2 CO3.Demonstrate the knowledge of combinatorics by solving relevant problems.-L2 CO4.Solve linear recurrence relations by recognizing homogeneity, linearity and constant coefficients.[L3] CO5.Explain the basic concepts of graph theory.[L2]		

4CSPL1021: DATA STRUCTURES USING C		
A. Course Framework		
Credits: 2-0-1-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 60**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Use modular programming approach in diversified problem domains L2 **CO2:** To use effective and efficient data structures in solving various Computer Engineering domain problems. L2 **CO3:** To analyze the problems to apply suitable data structure. L3 **CO4:** Use different types of data structures, operations and algorithms L2 **CO5:** Use Trees and Graphs in problem solving L2		

4ENCE2011: Digital Logic Design

A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours:45**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1	Make use of fundamental concepts to implement digital logic functions.	L1
CO2	Build a different combinational logic circuit.	L2
CO3	Develop synchronous and asynchronous sequential circuits, and realize using Hardware description Language and programmable logic devices.	L3
CO4	Develop a sequential circuit using Memory and PLDs	L3
CO5	Design finite state machine for different applications.	L6
PO: PO1/PO2/PO3/PO4/PO5	PSO:PSO1/PSO2/PSO3	

4CSPL2011: WEB DEVELOPMENT USING PYTHON AND DJANGO		
A. Course Framework		
Credits: 2-0-1-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours:60**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Create database using SQLite		L6
CO2: Create web client programs using python		L6
CO3: Create web server programs using python		L6
CO4: Create website using Django framework		L6
CO5: Create to-do application using Django and React JS		L6

CPSES1011: MAKING WITH ELECTRONICS		
A. Course Framework		
Credits: 1-0-2-3		**Syllabus Version: 1**
Contact Hours / Week: 5	**Total Contact Hours: 75**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Demonstrate the interfacing of basic input and output devices using Arduino.		L2

CO2: Explain the working principles of various sensors and renewable energy sources.	L2
CO3: Apply the understanding of Arduino programming by interfacing sensors and communication devices.	L3
CO4: Demonstrate the interfacing of basic input and output devices using Raspberry Pi.	L2
CO5: Analyze and Build a real-time application employing Arduino / Raspberry Pi.	L4,L3

IV SEMESTER

4MATH2021-ENGINEERING MATHEMATICS-IV		
A. Course Framework		
Credits: 3-1-0-4		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 60**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1 Apply binomial, Poisson, normal and exponential probability distributions to solve engineering problems		L3
CO2 Construct elementary regression models by the method of least squares		L3
CO3 Explain the concept of testing of hypothesis for small and large samples		L2
CO4 Apply the knowledge and skills of numerical methods to solve algebraic and transcendental equations		L3
CO5 Apply the simplex algorithm to solve a linear programming problem		L3

4CSPL3011: PYTHON FOR DATA SCIENCE		
A. Course Framework		
Credits: 2-0-1-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours:60**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Analyze data science applications		L4
CO2: Apply data collection and wrangling techniques		L3
CO3: Analyze how to manipulate the uncharted datasets using Numpy		L4
CO4: Analyze how to manipulate the uncharted datasets using Pandas		L4
CO5: Apply visualization techniques		L4

4CSGC2011: DATABASE MANAGEMENT SYSTEMS	
A. Course Framework	
Credits: 2-0-1-3	**Syllabus Version: 1**

Contact Hours / Week: 4	Total Contact Hours: 60	Level: 200
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Differentiate database systems from file system by understanding the features of database system and design a ER model for a database system L4 **CO2:** Develop solutions to a broad range of query and data update problems using relational algebra, relational calculus and SQL. L3 **CO3:** Apply the normalization theory in relational databases for removing anomalies. L3 **CO4:**. Compare database storage and access techniques for file organization, indexing methods and Query Processing. L2 **CO5:**. Analyze the basic issues of transaction processing, concurrency control, deadlock and its recovery schemes L2		

4CSGC2021: THEORY OF COMPUTATION		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Construct automata, regular expression for any pattern. L6 **CO2:**Illustrate Context free grammar for any construct L3 **CO3:** Explain design of Turing machines for any language. L2 **CO4:**Discuss computation solutions using Turing machines L2 **CO5:**.Examine whether a problem is decidable or not L4		

4CSPL2021: OBJECT ORIENTED PROGRAMMING USING JAVA		
A. Course Framework		
Credits: 2-0-1-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 60**	**Level: 200**
Course Outcomes:		

On successful completion of the course, students will be able to:	
CO1:Apply Java programming constructs for problem solving	L4
CO2:.Apply object oriented programming concepts for problem solving	L3
CO3:Analyze various run-time exceptions and can handle those exceptions	L3
CO4:.Make use of classes and interfaces of Java collection framework	L2
CO5:.Develop GUI based applications in Java	L2

V SEMESTER

4CSGC2041: OPERATING SYSTEMS		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Explain various functionalities of OS and concept of multithreading		L4
CO2: Apply process scheduling and synchronization techniques		L3
CO3: Apply appropriate method to overcome deadlock and explain concept of various memory management techniques		L3
CO4: Explain the structure and implementation of various secondary storage devices		L2
CO5: Explain various protection and security management techniques in OS		L2

4CSGC2051: DESIGN AND ANALYSIS OF ALGORITHMS		
A. Course Framework		
Credits: 3-0-1-4		**Syllabus Version: 1**
Contact Hours / Week: 5	**Total Contact Hours: 75**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Identify various algorithm design techniques and strategies		L4
CO2: Represent various asymptotic performance of algorithm		L3
CO3: Illustrate the computational complexity of different algorithms		L3
CO4: Analyse and find the best algorithm for real time problem solving		L2
CO5: Construct best algorithm for real time problem solving		L2

4CSGC2091: COMPUTER ORGANIZATION AND ARCHITECTURE

A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Illustrate the various functional units of digital computers		L4
CO2: Illustrate different concepts of CPU		L3
CO3: Outline instruction execution using pipeline		L3
CO4: Apply various hardware software concepts on instructions to exploit ILP		L2
CO5: Explain Cache optimization techniques to improve system performance		L2

4CSPL3021 - ADVANCED PYTHON FOR AI		
A. Course Frame Work:		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1	Identify the basic concepts of neural networks and its components	L2
CO2	Analyse neural network learning and adaption techniques	L3
CO3	Explain the detailed concepts of single layer perceptron neural networks	L2
CO4	Illustrate the detailed concepts of multilayer perceptron neural networks	L3
CO5	Explain the different associative memory concepts in retrieving information in data	L2

4CSPL3031: R Language (MOOC)		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Understand the Installation steps and fundamental functions of R language		L2
CO2: Apply the Conditional constructs and data management in data processing		L2
CO3: Use the data management concepts in the programming		L3
CO4: Understand the Data Frames and its use in data processing		L1

CO5: Apply the data visualization tools to plot the data in different formats	L3

4CSGC3041: Cryptography (MOOC)		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Explain the different concepts of cryptography CO2: Describe the principles of symmetric and asymmetric cryptography CO3: To apply the asymmetric key encipherment techniques CO4: To apply the concepts of hashing algorithms CO5: Understanding the real life examples of Cryptography		

4CSGC3051: Software Security (MOOC)		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Understand the basics of secure programming **CO2:** Understand the most frequent programming errors leading to software vulnerabilities **CO3:** Identify and analyze security problems in software **CO4:** To fix software flaws and bugs in various software **CO5:** Understanding to prevent the cybercrime		

4CSGC3061: Secure Coding		
A. Course Framework		
Credits: 3-0-0		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Understand the concept of secure programming **CO2:** Design and develop of secure programming		

Concept **CO3:** Apply the Robust Programming concept in token generation **CO4:**. Implement and develop some case studies **CO5:**. Analyze and use some test method for detecting flaws

4CSPL3041: Advanced Java		
A. Course Framework		
Credits: 3-0-0		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Understand and implement advanced Java concepts **CO2:** Design and implement server-side programs using Servlets and JSP **CO3:** Implements applications using Java Server Faces **CO4:** Incorporate cutting-edge frameworks in web application development **CO5:** Design and implementation of ORM mapping using Hibernates		

4CSPL3051: Scripting Languages		
Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Comprehend the differences between typical scripting languages and typical system and		

application programming languages.
CO2: Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
CO3: Acquire programming skills in scripting language.
CO4: Understanding the text manipulation through Perl
CO5: Understanding of how applications communicating with each other and how a widget toolkit used for building GUI in many languages.

4CSPL3061: Kotlin (OO+ Functional) (MOOC)		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** To learn a readable, pragmatic, safe, and interoperable programming language **CO2:** To think about nullability from the start by integrating nullability into the type system **CO3:** Acquire programming skills in Kotlin **CO4:** Understanding the Android development through Kotlin **CO5:** To aid scalability in large-scale software development		

4CSPL3071: Network Programming in Unix & C		
A. Course Framework		
Credits: 3-0-0		**Syllabus Version: 1**
Contact Hours / Week: 45	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: CO1: Identify interfaces and frameworks for developing network applications. CO2: Solve the socket functions for data communication. CO3: Design TCP echo client server program. CO4: Develop UDP Client Server programs using socket functions. CO5: Analyze the difference between broadcast and multicast programs.		

4CSPL3081: Python for Networking		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**

Course Outcomes:
On successful completion of the course, students will be able to: **CO1:** Demonstrate the basic elements of a relational database management system. **CO2:** Identify the data models for relevant problems **CO3:** Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data into RDBMS and formulate SQL queries on the data. **CO4:** Demonstrate their understanding of key notions of query evaluation and optimization techniques. **CO5:** Extend normalization for the development of application softwares.

4CSGC3071: Client-Server Technologies		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Recognize and describe the working of Computer Networks, Client server computing. **CO2:** Illustrate reference models with layers, protocols and interfaces. **CO3:** Summarize functionalities of different Layers. **CO4:** Combine and distinguish functionalities of different Layers. **CO5:** Model the Client- Server computing using different media.		

4CSPL3061: Object Oriented Programming		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Discuss the concepts of object-oriented programming **CO2:** Apply OOP concepts to develop programs using functions and class **CO3:** Incorporate the inheritance and constructor concepts to develop applications in C++ **CO4:** Apply operator overloading concepts in C++ **CO5:** Exemplify the process of data file manipulations, templates and exception handling using C++		

4CSGC2011: Database Management Systems

A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Demonstrate the basic elements of a relational database management system. **CO2:** Identify the data models for relevant problems **CO3:** Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data into RDBMS and formulate SQL queries on the data. **CO4:** Demonstrate their understanding of key notions of query evaluation and optimization techniques. **CO5:** Extend normalization for the development of application softwares.		

4CSGC1021: OFFICE AUTOMATION		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 45	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: CO1: Applying basic editing functions formatting skills on paragraphs, tables, lists, and pages CO2: Applicable knowledge and uses of accepted business style formatting conventions. CO3: Working knowledge of organizing and displaying large amounts and complex data CO4: Learnt to work with Master Slides to make editing your presentation easy CO5: Learnt the importance of web and in social media		

VI SEMESTER

4CSGC2061: DATA COMMUNICATION AND COMPUTER NETWORKS		
Course Frame Work:		
Credits: L–T–P: 2–0–1		**Total Credits: 3**
Contact Hours/Week: 4	**Direct Teaching Hours: 30**	**Total Contact Hours: 60**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Outline basic concepts in data communications, OSI and TCP/IP protocol stack	L2
CO2	Demonstrate design issues, flow control and error control	L2
CO3	Understand the transfer of data from source to the destination using different protocols and addressing	L2
CO4	Summarize the functions of application layer protocols and how to meet the QoS requirements in networking	L2
CO5	Identify the limits and importance of compression, encoding, sampling, quantization methods	L3

4CSPL2041: INTRODUCTION TO MACHINE LEARNING		
Course Frame Work:		
Credits: L–T–P: 2–0–1		**Total Credits: 3**
Contact Hours/Week: 4	**Direct Teaching Hours: 30**	**Total Contact Hours: 60**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Apply various classification and clustering techniques for problems using tools like R and Python.	L2
CO2	Implement solutions for various prediction problems using tools.	L2
CO3	Design and development of game and traffic control system using reinforcement learning.	L2
CO4	Identify and apply the appropriate machine learning techniques for classification, Pattern recognition, optimization and decision problems.	L2
CO5	Development of techniques in information science applications by applying Computational intelligence and appropriate machine learning techniques.	L3

4CSGC2071: CLOUD COMPUTING		
Course Frame Work:		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes (COs):
On successful completion of the course, students will be able to:

CO 1	Explain main concepts, key technologies, strengths and limitations of cloud computing	L 2
CO 2	Explain the cloud enabling technologies that help in the development of cloud	L 2
CO 3	Develop the ability to use the architecture of compute and storage cloud, service and delivery models	L 3
CO 4	Explain core issues of cloud computing such as resource management and security	L 2
CO 5	Choose the appropriate technologies and approaches for implementation and use of cloud	L 3

4CSGC2081- Software Engineering		
A. Course Frame Work		
Credits: L-T-P: 3 – 0 – 0 - 3		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes:
On successful completion of the course, students will be able to:

1. Explain the principles of the engineering processes in software development. (L2)
2. Develop the software projects through activities such as planning and scheduling. (L3)
3. Classify and specify the requirements for the software projects. (L2)
4. Design the prototype of the software projects. (L4)
5. Implement the software development processes activities from requirements to validation and verification. (L3)

4CSGC3121: Soft Computing (Fuzzy, Genetic, Ontologies)		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 45**	**Level: 300**

Course Outcomes:

On successful completion of the course, students will be able to:
CO1: Students will acquire a solid comprehension of the fundamental concepts and principles that form the foundation of soft computing L4
CO2: Students will develop the ability to identify and analyze complex problems in various domains and apply soft computing techniques to devise effective solutions. L3

CO3: Students will be able to select appropriate soft computing algorithms based on problem requirements L3 **CO4:** Students will learn how to design and develop soft computing models by defining the problem domain. L2 **CO5:** Students will be able to evaluate the performance of soft computing models using appropriate evaluation metrics and statistical analysis techniques L2

4CSPL3091- No-SQL DATABASES		
Course Frame Work:		
Credits: L-T-P: 3 – 0 – 0-3		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**
Course Outcomes: On successful completion of the course, students will be able to: 6. Elaborate the fundamental concepts of No-SQL databases. (L2) 7. Analyze the features and use cases of key-value databases.(L3) 8. Explain the features and challenges pertaining to document databases.(L2) 9. Illustrate the characteristics of column oriented No-SQL databases.(L4) 10. Describe the design and use cases of graph databases.(L3)		

4CSPL3101: APPLIED MACHINE LEARNING		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 45**	**Level: P5**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Apply machine learning in real world projects L4 **CO2:** Analyse and apply various classification algorithms L3 **CO3:** Analyse various prediction algorithms L3 **CO4:** Elaborate the clustering algorithms L2 **CO5:**Construct machine Learning Models L2		

4CSGC3131: System Security		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Describe the knowledge about secure software system assurance and evaluation L2 **CO2:** To conduct a cyber security risk assessment L2		

CO3: To measure the performance and troubleshoot cyber security systems	L3
CO4: To implement cyber security solutions.	L2
CO5: To analyze the network security	L3

4CSGC3141: Ethical Hacking		
0. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level:**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Describe the basics of the ethical hacking		L2
CO2: Describe the foot printing and scanning		L2
CO3: Demonstrate the techniques and countermeasures for system hacking		L3
CO4: Characterize the malware and their attacks		L2
CO5: Analyze the hardware Security concerns		L3

4CSGC3151: Malware analysis		
Course Frame Work:		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**
Course Outcomes (COs):		
On successful completion of the course, students will be able to:		
CO1	Explain the Basic Static Techniques to get information from an executable without running it.	L1
CO2	Analyse malware in virtual machines to set up virtual machines to use as a safe environment for running malware	L2
CO3	To apply techniques for analyzing a malicious program	L2
CO4	To Analyze Malicious Windows Programs," for understanding malicious Windows programs	L3
CO5	Explain how to use malware analysis to create network signatures that outperform signatures made from captured traffic alone	L2

4CSPL3111: Object Oriented Analysis Design
A. Course Framework

Credits: 3-0-0-3		Syllabus Version: 1
Contact Hours / Week: 4	Total Contact Hours: 45	Level: 200
Course Outcomes:		

On successful completion of the course, students will be able to:

CO1: To learn techniques for testing and validating object-oriented systems, including unit testing, integration testing, and acceptance testing, to ensure the correctness and reliability of the software. L1

CO2: To develop skills in collaborating effectively within a team environment, including communication, task allocation, and version control, to collectively design and implement object-oriented systems. L5

CO3: To understand the importance of non-functional requirements, such as performance, scalability, and security, and learn how to incorporate them into the analysis and design process. L3

CO4: To stay updated with the latest trends and technologies in object-oriented analysis and design, allowing them to adapt and apply new techniques and tools as they evolve. L3

CO5: To demonstrate ethical and professional behaviour in the analysis and design of software systems, considering legal and societal implications, as well as adhering to industry best practices and standards. L5

4CSPL3121: Web Technology Frameworks		
A. Course Framework		
Credits: 3-0-0-3		Syllabus Version: 1
Contact Hours / Week: 4	Total Contact Hours: 45	Level: 200
Prerequisite: (If applicable)	Nil	
Course Outcomes:		

On successful completion of the course, students will be able to:

CO1: Students will be able to Develop a solid understanding of the MERN stack and how it can be used to build scalable, high-performance full-stack web applications. L1

CO2: Students will Gain hands-on experience with building web applications using the MERN stack, including setting up a development environment, creating and connecting to databases, building APIs, and integrating frontend and backend code. L5

CO3: Students will be able to learn best practices for building secure, performant, and maintainable web applications, including implementing authentication and authorization, optimizing database queries, and using tools for debugging and testing. L3

CO4:. Students will be able to understand how to design and implement scalable, distributed web applications that can handle large amounts of traffic and users, and deploy these applications to the cloud using popular cloud services. L3

CO5:. Students will be able to Acquire the skills and knowledge necessary to be able to build real-world web applications using the MERN stack and gain confidence in their ability to create high-quality, professional-grade software. L5

4CSPL3131: Application Development using MERN Stack (P5)		
Course Frame Work:		
Credits: L–T–P: 3–0–0		Total Credits: 3
Contact Hours/Week: 3	Direct Teaching Hours: 45	Total Contact Hours: 45

Course Outcomes (COs):	
On successful completion of the course, students will be able to:	
CO1: To Discover the details of HTML,CSS and their properties and applications	L2
CO2: Use the tools required to build JavaScript based SPAs	L2
CO3: Discover the details of React, the React Way, and how to get the maximum out of this library	L3
C04: Discover the details of Nodejs and how to get the maximum out of this library	L3
Co5: To Discover the details of SQL,MongoDB and Nosql	L2

4CSPL3141: Advanced Computer Networks		
Course Frame Work:		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**
Course Outcomes (COs): On successful completion of the course, students will be able to: CO1: To Understand the TCP/IP protocol suite and the working of the Internet. L2 CO2: Form an understanding of the principles upon which the global Internet was designed. L2 CO3: Discover the details of switching, bridges and LAN. L3 C04: Discover the details Simple Internetworking, Internet Protocol. L3 Co5: To Discover the details of UDP, TCP, RPC L2		

4CSGC3161: Wireless Technologies
B. Course Framework

Credits: 3-0-0-3		Syllabus Version: 1
Contact Hours / Week: 4	Total Contact Hours: 45	Level: 200

Course Outcomes:

On successful completion of the course, students will be able to:

CO1: Students will gain a comprehensive understanding of the principles and concepts of wireless communication, including modulation, transmission, and reception of wireless signals. L1

CO2: Students will develop the skills necessary to design and implement wireless networks, including understanding the transmission medium, evaluating network performance, and selecting appropriate technologies. L5

CO3: Students will be able to analyze and evaluate wireless technologies, including understanding the limitations of different protocols and the impact of environmental factors on network performance. L3

CO4:. Students will learn about the legal, ethical, and social implications of wireless communication, including privacy concerns, legal regulations, and the impact of wireless technologies on society. L3

CO5:. Students will develop problem-solving skills through hands-on projects and laboratory exercises, including designing, implementing, and testing wireless networks and communication systems. L5

4CSGC3171: Multimedia Networks

Course Frame Work:

Credits: L–T–P: 3–0–0		Total Credits: 3
Contact Hours/Week: 3	Direct Teaching Hours: 45	Total Contact Hours: 45

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1: To describe types of networks and multimedia network requirement L1

CO2: To describe end systems support for multimedia transport L2

CO3: To Describe and analyze QoS mechanisms and protocols L2

CO4:TO conduct performance analysis and discuss synchronization and adoption L3

CO5 :TO Discuss and evaluate multimedia over wireless networks. L3

4CSPL2071: Web Technology

A. Course Framework

Credits: 3-0-0-3		Syllabus Version: 1
Contact Hours / Week: 4	Total Contact Hours: 45	Level: 200

Course Outcomes:
On successful completion of the course, students will be able to: **CO1:** Students will be able to create simple static web pages using HTML and CSS. L1 **CO2:** Students will be able to add interactivity to web pages using JavaScript. L5 **CO3:** Students will be able to design responsive web pages that adapt to different screen sizes using a framework such as Bootstrap. L3 **CO4:**. Students will be able to create server-side applications using a server-side language such as PHP or Python. L3 **CO5:**. Students will be able to design and implement web applications that consume external APIs usingRESTful web services. L5

4CSPL2051: Mobile Application Development		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 2**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Explain the fundamental concepts of mobile application development L2 **CO2:** Design the application with activities and fragments L2 **CO3:** Apply different user interfaces to their application L3 **CO4:** Demonstrate the use of views and pictures L2 **CO5:** Use the different services in the application L3		

4CSGC2101 : Machine Learning for Beginners		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 45**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Explain the concepts of Machine Learning Categories L4 **CO2:** Analyse the fundamentals of Machine Learning L3 **CO3:** Analyse various models in Machine learning L3 **CO4:** Illustrate the Text Mining and Recommender Systems L2 **CO5:** Elucidate the Deep and Reinforcement Learning L2		

VII SEMESTER

4CSGC3011: ARTIFICIAL INTELLIGENCE		
A. COURSE FRAME WORK:		
Credits: L–T–P: 3–0–0		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Elucidate the basic concepts of Artificial Intelligence	L2
CO2	Analyze Artificial Intelligence techniques, such as search algorithms, for problem solving	L4
CO3	Apply techniques of Knowledge Representation and Planning	L3
CO4	Apply knowledge of reasoning in the presence of incomplete or uncertain information	L3
CO5	Explain different forms of Learning	L2

4CSGC3021: NETWORK SECURITY

A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Explain the various concepts of Network Security	L3
CO2	Illustrate different cryptographic principles, algorithms and Message Authentication	L3
CO3	Infer the key distribution, key management issues and different cryptographic standards and certificates	L2
CO4	Interpret the various network security applications	L3
CO5	Identify fundamental notions of system security, threats, vulnerabilities, attacks, and countermeasures	L3

4CSGC3031: MOBILE APPLICATION DEVELOPMENT		
A: COURSE FRAME WORK:		
Credits: L–T–P: 2–0–1 :3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Explain the fundamental concepts of mobile application development CO2 Design responsive user interfaces that work across a wide range of devices CO3 Demonstrate the knowledge of data persistence in mobile applications	L 2 L
CO4	Outline networking and web services concepts in mobile applications	6
CO5	Apply the steps involved in publishing mobile application to share with the world	L 2 L2 L3

4CSPL4021: DEEP LEARNING		
A: COURSE FRAME WORK:		
Credits: L–T–P: 3–0–0		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 400**

Course Outcomes (COs):		
On successful completion of the course, students will be able to:		
CO1	Apply concepts of RNN and LSTM	L3
CO2	Demonstrate concepts of self-organizing maps in real-world applications	L3
CO3	Illustrate problems through pre trained model such as auto-encoders	L3
CO4	Interpret about Boltzmann machines and its applications	L3
CO5	Apply the concept of GANs and know its applications	L4

4CSPL4041: ROBOTIC PROCESS AUTOMATION		
A: COURSE FRAME WORK:		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes (COs):		
On successful completion of the course, students will be able to:		
CO1	Discuss the basic classification and structure of a robot.	L3
CO2	Explain the working and applications of various sensors and actuators used in robotics.	L3
CO3	Discuss the basic classification and structure of a robot.	L3
CO4	Explain the working and applications of various sensors and actuators used in robotics.	L3

4CSPL4051: Natural Language Processing		
A: COURSE FRAME WORK:		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Analyze the natural language text.	L4
CO2	Create the natural language.	L6
CO3	Analyze text mining	L4
CO4	Evaluation of self-explanation.	L2
CO5	Apply information retrieval techniques.	L3

4CSPL4061: MOBILE COMPUTING SECURITY		
A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	To know the basics of mobile communications	L3
CO2	To Understand different architectures of mobile computing	L3
CO3	To know about the working of mobile IP and data management	L2
CO4	To gain knowledge on wireless security in WLAN	L3
CO5	To know about internet security protocols and its applications	L2

4CSPL4071: DIGITAL FORENSICS	
A: COURSE FRAME WORK:	
Credits: L–T–P: 3–0–0	**Total Credits: 3**

Contact Hours/Week: 3	Direct Teaching Hours: 45	Total Contact Hours: 45

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Explain the fundamentals of digital forensics	L2
CO2	Apply computer forensic techniques to identify the digital fingerprints associated with criminal activities	L3
CO3	Apply forensic analysis tools to understand mobile device forensics	L3
CO4	Apply forensic analysis tools to understand cloud forensics	L3
CO5	Analyze email and social media investigations, laws and ethics involved in cybercrime	L4

4CSPL4081: CLOUD COMPUTING SECURITY		
A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	To know the basics of mobile communications	L3
CO2	To Understand different architectures of mobile computing	L3
CO3	To know about the working of mobile IP and data management	L2
CO4	To gain knowledge on wireless security in WLAN	L3
CO5	To understand the web-based application in WLAN	L2

4CSPL4091: WEB SECURITY	
A: COURSE FRAMEWORK	
Credits: 3-0-0-3	**Syllabus Version: 1**

Contact Hours / Week: 3:0:0	Total Contact Hours: 45	Level: 100

Course Outcomes:

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Understand basic web security terminology and concepts.	L 3
CO2	Apply input validation and sanitization to mitigate injection attacks.	L 3
CO3	Understand the importance of multi-factor authentication (MFA) for enhancing security.	L 2
CO4	Explain the principles of encryption, hashing, and digital signatures.	L3
CO5	Identify and analyze emerging threats and attack vectors targeting web applications.	L3

4CSPL4101: J2EE TECHNOLOGIES		
A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 400**

Course Outcomes:

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Acquire knowledge of advanced topics such as frameworks like Spring and Hibernate, security, and performance tuning in J2EE applications.	L3
CO2	Understand XML and Web Services.	L3
CO3	Develop dynamic web applications using Servlets and JSP, implementing session management techniques.	L2
CO4	Gain a comprehensive understanding of J2EE architecture and components.	L3
CO5	Understand the J2EE applications	L2

4CSPL4111: .NET TECHNOLOGIES
A: COURSE FRAMEWORK

Credits: 3-0-0-3		Syllabus Version: 1
Contact Hours / Week: 3:0:0	Total Contact Hours: 45	Level: 400

Course Outcomes:

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Students will be able to develop dynamic web applications using ASP.NET Web	L3 Forms.
CO2	Understand the lifecycle of web forms, utilize server controls.	L3
CO3	Students will gain a comprehensive understanding of the .NET Framework architecture.	L2
CO4	Understand the separation of concerns, build controllers and views, perform binding and validation	L3 model
CO5	Gain the knowledge about .NET applications and OWASP	L2

4CSPL4121: JAVASCRIPT		
A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 100**

Course Outcomes:

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Write programs in PHP language for server-side scripting	L3
CO2	To Understand XML and processing of XML Data with Java	L3
CO3	To Develop server-side programming using JSP	L3
CO4	To develop the programs of client-side scripting using JavaScript	L2
CO5	Use AJAX with PHP and MySQL.	L3 L3

4CSPL4131: MICROSERVICES	
A: COURSE FRAME WORK	
Credits: L–T–P: 3–0–0	**Total Credits: 3**

Contact Hours/Week: 3	Direct Teaching Hours: 45	Total Contact Hours: 45

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Explain the foundations and concepts of service-based computing	L2
CO2	Illustrate the basic operational model of web services	L2
CO3	Analyze key technologies in the service-oriented computing arena.	L4
CO4	Build the web service framework with respect to SOA.	L3
CO5	Develop web services using SOA	L3

4CSPL4141: SOFTWARE DEFINED NETWORKS		
A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 100**

Course Outcomes:

On successful completion of the course, students will be able to:

CO1	Describe the benefits of SDN by the separation of data and control planes	L3
CO2	Discuss SDN controllers and application model	L3
CO3	Compare traditional networks and software defined networks	L2
CO4	Employ software programs to perform varying and complex networking tasks	L3
CO5	Solve real world problems using SDN and Describe various technologies in Data center	L3

4CSPL4151: STORAGE AREA NETWORKS		
A: COURSE FRAME WORK		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Explain basic concepts for Storage systems	L2
CO2	Apply the concepts of storage networking technologies	L3
CO3	Explain the concepts in Backup, Archive and Replication	L2
CO4	Analyze the concepts of cloud computing and virtualization	L4
CO5	Explain various concepts in managing and securing storage infrastructure	L2

4CSPL4161: VIRTUALIZATION & CLOUD COMPUTING		
A: COURSE FRAME WORK		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Discuss the features of different distributed and cloud computing technologies such as cluster computers, coordinated computers, peer-to- peer systems and parallel and distributed computing models	L2
CO2	Explain the features of virtualization middleware such as VMM and Hypervisor	L3
CO3	Describe full virtualization and para virtualization	L2
CO4	Discuss different aspects of cloud security including security defense strategies, distributed intrusion detection, and cloud security software	L4
CO5	Apply the knowledge on AWS and Microsoft Azure to set up simple cloud-based applications and services	L2

4CSPL4171: NETWORK ADMINISTRATION		
A: COURSE FRAME WORK		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1 Discuss the features of different distributed and cloud computing technologies such as cluster computers, coordinated computers, peer-to-peer systems and parallel and distributed computing models — L2

CO2 Explain the features of virtualization middleware such as VMM and Hypervisor — L3

CO3 Describe full virtualization and para virtualization — L2

CO4 Discuss different aspects of cloud security including security defence strategies, distributed intrusion detection, and cloud security software — L4

CO5 Apply the knowledge on AWS and Microsoft Azure to set up simple cloud-based applications and services — L2

6IDSS1031: BASICS OF ENTREPRENEURSHIP		
A. Course Framework		
Credits: L-T-P-C: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: Take risk to start a new enterprise and can help the established business. (Level 4) **CO2**: Identify the elements of success of entrepreneurial ventures. (Level 2) **CO3**: Consider the legal and financial conditions for starting a business venture. (Level 2) **CO4**: Analyse the business environment in order to identify business opportunities.(Level 3) **CO5**: Interpret their own business plan. (Level 4)		

6IDSS1051: FINANCE FOR NON-FINANCE STUDENTS		
A. Course Framework		
Credits: L-T-P-C: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		

CO1: Impart the time value of money in valuation of securities. (Level 3) **CO2:** Understand and focus on financial discipline and capital structure in organisations. (Level 3) **CO3:** Appreciate new methods of financing, investing, operating and business decisions. (Level 3) **CO4:** Assess appropriate measures related to dividend decisions in organisations. (Level 4)

6IDSS1071: MARKETING -FOR THE UNINITIATED		
A. **Course Framework**		
Credits: L-T-P-C: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: Understand the basic concepts of marketing. (Level 2) **CO2**: Analyze market segment and target market. (Level 4) **CO3**: Evaluate the marketing mix to make effective marketing decisions. (Level 6) **CO4**: Apply the necessary marketing skills. (Level 3) **CO5**: Analyse the IMC and recent trends. (Level 4)		

3IDSS1031: Introduction to Taxation		
A. Course Framework		
Credits: L-T-P-C: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: Acquire the complete knowledge of basic concepts of income tax. (Level 1) **CO2 & CO3:** Apply the provisions and compute income under different heads. (Level 2) **CO4**: Identify and comply with the relevant Income from other Sources and Set-off and carry Forward of Losses. (Level 3) **CO5**: Equip basics of goods and service tax (Level 4)		

3IDSS1071: Financial Markets and Personal Investment
A. Course Framework

Credits: L-T-P-C: 3-0-0-3		Syllabus Version: 1
Contact Hours / Week: 3	Total Contact Hours: 45	Level: 100
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: Able to understand the concepts of financial markets and personal investment. (Level 1) **CO2**: Able to analyze the existence of different types of financial markets and their relative importance. (Level 3) **CO3**: Able to assess the need and importance of the issue of IPO. **CO4**: Able to judge the process of operations in secondary markets and the existence of different regulatory authorities in stock market operations (Level 3) **CO5**: Able to make assessments and make investment in personal investment in their life. (Level 4)		

5IDSS1011: Essentials of Human Rights and Public Interest Laws		
A. Course Framework		
Credits: L-T-P-C: 3-0-0-3		**SyllabusVersion: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: Understand core concepts involved in evolution and development of human rights law. (Level 2) **CO2**: Understand constitutional aspects of human rights along with the statutory framework of National and State Human Rights Commissions(Level 3) **CO3**: Examine the various dimensions of human rights law and understand the role of state on issues relating to the enforcement of human rights (Level 4)		

7IDSS1021: Personality Development		
A. Course Framework		
Credits: L-T-P-C: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		

CO1: Understand how personality of an individual develops (Level 2) **CO2**: Apply their knowledge on personality development to make themselves better individuals (Level 4)

NIDSS1041: NCC IV		
A. Course Framework		
Credits: L-T-P-C: 4-0-3-7(4 credits for Course & 3 credits for Camp)		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 60**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: To understand, apply and practically explore the knowledge of community service and socio-political consciousness they acquired from this paper during camps and field works. (L1/L2) **CO2:** To practice a regimented way of life of the armed force in their trainings and ensure maximum benefits to the students and the society. (L1/L3) **CO3:** The cadets will employ and engage in practicing disciplined routines such as cleaning and maintaining their line area, organizing security in and around the camp, making part of the purchase committee, organizing the mess and distribution of food, etc. (L5/L6) **CO4:** The cadets will understand and develop specified skill sets such as problem solving, decision making, critical thinking, team work, etc. to address real life problems and prescribe practical solution; the students will understand the process of decision analysis (L2/L3/L5/L6)		

NIDSS1021: NCC II		
A. Course Framework		
STE 2021-25 **Credits: L-T-P-C: 2-0-3-5 (2 credits for Theory & 3 credits for Camp)**		**Syllabus Version: 1**
Contact Hours / Week: 2	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: To understand, apply and practically explore the knowledge of community service and socio-political consciousness they acquired from this paper during camps and field works. (L1/L2) **CO2:** To practice a regimented way of life of the armed force in their training and ensure maximum benefits to the students and the society. (L1/L3) **CO3:** The cadets will employ and engage in practicing disciplined routines such as cleaning and maintaining their line area, organizing security in and around the camp, making part of the purchase committee, organizing the mess and distribution of food, etc. (L5/L6) **CO4:** The cadets will understand and develop specific skill sets such as problem solving, decision making, critical thinking, team work, etc. to address real life problems and prescribe practical solution; the students will understand the process of decision analysis (L2/L3/L5/L6)		

VIII SEMESTER

4CAPS4010: CAPSTONE PROJECT PHASE II		
Course Frame Work:		
Credits: L–T–P: 0–0–8		**Total Credits: 8**
Contact Hours/Week: 8	**Direct Teaching Hours: 0**	**Total Contact Hours: 120**

Course Outcomes	**(COs):On successful completion of the course, students will be able to:**	
CO1	Compare the project built with other possible existing solutions to come to a conclusion about its feasibility and reliability	L4
CO2	Utilize proper project management techniques and planning methods to produce cost effective projects	L3
CO3	Recommend the need to implementing the project with supporting justification and possible areas to improve it and compile a clear report containing the step by step process of building the project that includes all calculations, analysis and fabrication methods involved	L5
CO4	Build the real-world implementation of the design that will realize the objectives of the prototype/ design	L6
CO5	Demonstrate working in groups taking leadership role and communicating effectively	L2

SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of Computer Science Engineering

Cos

2022 Batch

4MATH1011: ENGINEERING MATHEMATICS -I		
A. Course Framework		
Credits: 3-1-0-4		**Syllabus Version: 1**
Contact Hours / Week: 45+15	**Total Contact Hours: 60**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Apply the knowledge of calculus to analyse and approximate the functions. L3 **CO2:** Calculate rates of change of multivariate functions. L3 **CO3:** Solve multiple integrals for computing area and volume. L3 **CO4:** Make use of Gradient, divergence and curl for solving Engineering problems. L3 **CO5:** Use the concept vector integration to solve the flow problems. L3		

4PHY1011: ENGINEERING PHYSICS -I	
Course Framework	
Credits: 3-0-1-4	**Syllabus Version:1**
Course Outcomes:	
On successful completion of the course, students will be able to: CO1: Analyse the applications of quantum mechanics in technology. L4 CO2: Make use of Lasers and Optical fibres for different industrial applications. L3 CO3: Plot the I-V characteristics of photo-diode, LED, Zener diodes and solar cells. L3 CO4: Explain the use of Magnetic, Dielectric and Superconducting materials for different engineering applications. L2 CO5: Analyse the results obtained in different experiments. L4	

4ENEE1011: ELEMENTS OF ELECTRICAL ENGINEERING		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 45	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Analyze electrical circuits by relevant Laws in DC circuits. L4 **CO2:** Demonstrate the single phase and three-phase power generation by using the phasor diagrams. L3 **CO3:** Illustrate the construction and operation of DC machines and understand the concept of electrical wiring, protecting devices and earthing. L3 **CO4:** Explain the construction and operation of AC machines. L2		

4CSGC1011: ELEMENTS OF COMPUTER ENGINEERING		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 45	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Demonstrate functioning of different sub-systems, OS and different types of OS. L3 **CO2:** Use different types of data structures, operations and algorithms. L3 **CO3:** Describe the fundamental elements of relational database management systems. L2 **CO4:** Comprehend the layered protocol model & Classification of networks. L3 **CO5:** Demonstrate need for Linux OS and Linux commands. L3		

4ENME1011: COMPUTER AIDED ENGINEERING DRAWING		
A. Course Framework		
Credits: 1-0-2-3		**Syllabus Version: 1**
Contact Hours / Week: 15+60	**Total Contact Hours: 75**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Illustrate competence in basics of orthographic projections of points, lines, planes and solids in three different views. L3 **CO2:** Apply the concepts of orthographic projections for simple objects. L3 **CO3:** Develop surfaces of solids of simple objects. **L3**		

II SEMESTER

4MATH1021: ENGINEERING MATHEMATICS II		
A. Course Framework		
Credits: 3-1-0-4		**Syllabus Version: 1**
Contact Hours / Week: 45+15	**Total Contact Hours: 60**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Solve first order linear ordinary differential equations L3 **CO2:** Solve higher order differential equations arising through physical processes. L3 **CO3:** Construct a variety of partial differential equations and solve them. L4 **CO4:** Use periodic signals to represent periodic functions in the form of Fourier series. L3		

CO5: Make use of matrix theory for solving system of linear equations	L3

4CHEM1011: ENGINEERING CHEMISTRY		
A. Course Framework		
Credits: 1-0-1-2		**Syllabus Version: 1.0**
Contact Hours / Week: 15+22	**Total Contact Hours: 37**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Explain the construction and working of Energy storage devices. L2 **CO2:** Explain corrosion of metals, factors and prevention techniques. L2 **CO3:** Explain the importance of the modern emerging field of nanotechnology. L2 **CO4:** Use instruments which give quick and accurate results for material analysis. L3 **CO5:** Carry out different types of titrations for estimation of concentration of an analyte. L3		

4ENCE1011: ELEMENTS OF ELECTRONICS ENGINEERING		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version:1**
Contact Hours / Week: 45	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Describe semiconductor devices and its applications L2 **CO2:** Analyze the various circuits of BJT L4 **CO3:** Employ op-amp in various circuits L3 **CO4:** Analyze digital circuits L4 **CO5:** Appreciate the importance of transducers and communication systems L5		

4EME1022 : ELEMENTS OF MECHANICAL ENGINEERING AND WORKSHOP		
A. Course Framework		
Credits: 2-0-1-3:		**Syllabus Version:2.0**
Contact Hours / Week: 30+30	**Total Contact Hours: 60**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1** Recognize the impact of energy sources on the environment and sustainability. L2 **CO2** Explain the working principles of water, vapour and gas-powered systems. L2 **CO3** Discuss the working principles of refrigeration systems and IC engines. L2		

CO4 Compute various performance parameters of IC engines. L3 **CO5** Demonstrate soldering, brazing and welding of sheet metal & welded joints. L2

4ENCV1011: ELEMENTS OF CIVIL ENGINEERING		
A. Course Framework		
Credits: 2-1-0-3:		**Syllabus Version: 1**
Contact Hours / Week: 30+15	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Explain the basics of Civil Engineering and related fields.		L2
CO2: Develop working models with the laws of mechanics.		L3
CO3: Analyze equilibrium of coplanar, concurrent and non-concurrent forces.		L4
CO4: Determine centroid and moment of inertia of simple geometric figures.		L3
CO5: Apply D'Alembert's principle in any specific application.		L3
PO: PO1/PO2/PO3/PO4	**PSO: PSO1**	

4CSPL1011: PROBLEM SOLVING USING PYTHON		
A. Course Framework		
Credits: 2-0-1-3		**Syllabus Version: 1**
Contact Hours / Week: 30+30	**Total Contact Hours:60**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Understand the basis of algorithm problem solving		L2
CO2: Read/Write simple simple python programs		L3
CO3: Develop python programs with conditionals and loops		L4
CO4: Use python functions and python data structures		L3
CO5: Read and write data from/to files in python programs		L3

III SEMESTER

4MATH2011-ENGINEERING MATHEMATICS-III		
A. Course Framework		
Credits: 3-1-0-4		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 60**	**Level: 200**
Course Outcomes:		

CO1 Make use of C–R equations to form analytic functions	L3
CO2 Explain the concept of conformal, bilinear transformations and contour integration	L2
CO3 Apply Z-transforms for discrete functions.	L3
CO4 Solve linear differential equations by Laplace transform method	L3
CO5 Solve first and second order ordinary differential equation using single step and multistep numerical methods	L3

4CSPL1111 : Problem solving and programming using C		
A. Course Framework		
Credits: 1-0-1-2		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Explain the basic computer concepts and programming principles of C language L2 **CO2:** Develop C programs to solve simple mathematical, engineering problems using conditionals and looping constructs L4 **CO3:** Develop C programs to demonstrate the applications of arrays in C L4 **CO4:** Execute programs to demonstrate the basic concepts of Strings and Pointers L3 **CO5:** Develop C programs to demonstrate the applications of functions in C L4		

4CSPL1022: DATA STRUCTURES		
A. Course Framework		
Credits: 2-0-1-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 60**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: CO1: Choose appropriate data structure as applied to specified problem Definition L2 CO2: Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures L3 CO3: Apply concepts learned in various domains like DBMS, compiler etc. L3 CO4: Use linear and non-linear data structures like stacks, queues, linked list. L3 CO5: write the programs using data structures in any programming language L4		

4ENCE2011: Digital Logic Design		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours:45**	**Level: 200**
Course Outcomes:		

On successful completion of the course, students will be able to:		
CO1	Make use of fundamental concepts to implement digital logic functions.	L1
CO2	Build a different combinational logic circuit.	L2
CO3	Develop synchronous and asynchronous sequential circuits, and realize using Hardware description Language and programmable logic devices.	L3
CO4	Develop a sequential circuit using Memory and PLDs	L3
CO5	Design finite state machine for different applications.	L6
PO: PO1/PO2/PO3/PO4/PO5		PSO:PSO1/PSO2/PSO3

4CSPL2011: WEB DEVELOPMENT USING PYTHON AND DJANGO		
A. Course Framework		
Credits: 2-0-1-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours:60**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Create database using SQLite L6 **CO2:** Create web client programs using python L6 **CO3:** Create web server programs using python L6 **CO4:** Create website using Django framework L6 **CO5:** Create to-do application using Django and React JS L6		

CPSES1011: MAKING WITH ELECTRONICS		
A. Course Framework		
Credits: 1-0-2-3		**Syllabus Version: 1**
Contact Hours / Week: 5	**Total Contact Hours: 75**	**Level: 100**
Course Outcomes:		

On successful completion of the course, students will be able to: **CO1:** Demonstrate the interfacing of basic input and output devices using Arduino. L2 **CO2:** Explain the working principles of various sensors and renewable energy sources. L2 **CO3:** Apply the understanding of Arduino programming by interfacing sensors and communication devices. L3 **CO4:** Demonstrate the interfacing of basic input and output devices using Raspberry Pi. L2 **CO5:** Analyze and Build a real-time application employing Arduino / Raspberry Pi. L4,L3

IV SEMESTER

4MATH2021-ENGINEERING MATHEMATICS-IV		
A. Course Framework		
Credits: 3-1-0-4		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 60**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to: CO1 Apply binomial, Poisson, normal and exponential probability distributions to solve engineering problems L3 CO2 Construct elementary regression models by the method of least squares L3 CO3 Explain the concept of testing of hypothesis for small and large samples L2 CO4 Apply the knowledge and skills of numerical methods to solve algebraic and transcendental equations L3 CO5 Apply the simplex algorithm to solve a linear programming problem L3		

4CSPL3011: PYTHON FOR DATA SCIENCE		
A. Course Framework		
Credits: 2-0-1-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours:60**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to:		

CO1: Analyze data science applications	L4
CO2: Apply data collection and wrangling techniques	L3
CO3: Analyze how to manipulate the uncharted datasets using Numpy	L4
CO4: Analyze how to manipulate the uncharted datasets using Pandas	L4
CO5: Apply visualization techniques	L4

4CSGC2011: DATABASE MANAGEMENT SYSTEMS		
A. Course Framework		
Credits: 2-0-1-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 60**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Differentiate database systems from file system by understanding the features of database system and design a ER model for a database system L4 **CO2:** Develop solutions to a broad range of query and data update problems using relational algebra, relational calculus and SQL. L3 **CO3:** Apply the normalization theory in relational databases for removing anomalies. L3 **CO4:**. Compare database storage and access techniques for file organization, indexing methods and Query Processing. L2 **CO5:**. Analyze the basic issues of transaction processing, concurrency control, deadlock and its recovery schemes L2		

4CSGC2021: THEORY OF COMPUTATION		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Construct automata, regular expression for any pattern. L6 **CO2:**Illustrate Context free grammar for any construct L3 **CO3:** Explain design of Turing machines for any language. L2 **CO4:**Discuss computation solutions using Turing machines L2 **CO5:**.Examine whether a problem is decidable or not L4		

4CSPL2021: OBJECT ORIENTED PROGRAMMING USING JAVA		
A. Course Framework		
Credits: 2-0-1-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 60**	**Level: 200**
Course Outcomes:		

On successful completion of the course, students will be able to:	
CO1:Apply Java programming constructs for problem solving	L4
CO2:.Apply object oriented programming concepts for problem solving	L3
CO3:Analyze various run-time exceptions and can handle those exceptions	L3
CO4:.Make use of classes and interfaces of Java collection framework	L2
CO5:.Develop GUI based applications in Java	L2

V SEMESTER

4CSGC2041: OPERATING SYSTEMS		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Explain various functionalities of OS and concept of multithreading		L4
CO2: Apply process scheduling and synchronization techniques		L3
CO3: Apply appropriate method to overcome deadlock and explain concept of various memory management techniques		L3
CO4: Explain the structure and implementation of various secondary storage devices		L2
CO5: Explain various protection and security management techniques in OS		L2

4CSGC2051: DESIGN AND ANALYSIS OF ALGORITHMS		
A. Course Framework		
Credits: 3-0-1-4		**Syllabus Version: 1**
Contact Hours / Week: 5	**Total Contact Hours: 75**	**Level: 200**
Course Outcomes:		

On successful completion of the course, students will be able to:	
CO1: Identify various algorithm design techniques and strategies	L4
CO2: Represent various asymptotic performance of algorithm	L3
CO3: Illustrate the computational complexity of different algorithms	L3
CO4: Analyse and find the best algorithm for real time problem solving	L2
CO5: Construct best algorithm for real time problem solving	L2

4CSGC2091: COMPUTER ORGANIZATION AND ARCHITECTURE

A. Course Framework

Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 200**

Course Outcomes:

On successful completion of the course, students will be able to:	
CO1: Illustrate the various functional units of digital computers	L4
CO2: Illustrate different concepts of CPU	L3
CO3: Outline instruction execution using pipeline	L3
CO4: Apply various hardware software concepts on instructions to exploit ILP	L2
CO5: Explain Cache optimization techniques to improve system performance	L2

4CSPL3021 - ADVANCED PYTHON FOR AI

A. Course Frame Work:

Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes:

On successful completion of the course, students will be able to:

CO1	Identify the basic concepts of neural networks and its components	L2
CO2	Analyse neural network learning and adaption techniques	L3
CO3	Explain the detailed concepts of single layer perceptron neural networks	L2
CO4	Illustrate the detailed concepts of multilayer perceptron neural networks	L3
CO5	Explain the different associative memory concepts in retrieving information in	L2

data

4CSPL3031: R Language (MOOC)		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Understand the Installation steps and fundamental functions of R language L2 **CO2:** Apply the Conditional constructs and data management in data processing L2 **CO3:** Use the data management concepts in the programming L3 **CO4:** Understand the Data Frames and its use in data processing L1 **CO5:** Apply the data visualization tools to plot the data in different formats L3		

4CSGC3041: Cryptography (MOOC)		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Explain the different concepts of cryptography CO2: Describe the principles of symmetric and asymmetric cryptography CO3: To apply the asymmetric key encipherment techniques CO4: To apply the concepts of hashing algorithms CO5: Understanding the real life examples of Cryptography		

4CSGC3051: Software Security (MOOC)		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Understand the basics of secure programming **CO2:** Understand the most frequent programming errors leading to software vulnerabilities **CO3:** Identify and analyze security problems in software **CO4:** To fix software flaws and bugs in various software **CO5:** Understanding to prevent the cybercrime		

4CSGC3061: Secure Coding		
A. Course Framework		
Credits: 3-0-0		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Understand the concept of secure programming **CO2:** Design and develop of secure programming Concept **CO3:** Apply the Robust Programming concept in token generation **CO4:**. Implement and develop some case studies **CO5:**. Analyze and use some test method for detecting flaws		

4CSPL3041: Advanced Java		
A. Course Framework		
Credits: 3-0-0		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Understand and implement advanced Java concepts **CO2:** Design and implement server-side programs using Servlets and JSP **CO3:** Implements applications using Java Server Faces **CO4:** Incorporate cutting-edge frameworks in web application development **CO5:** Design and implementation of ORM mapping using Hibernates		

4CSPL3051: Scripting Languages		
Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Comprehend the differences between typical scripting languages and typical system and application programming languages. **CO2:** Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate		

language for solving a given problem.
CO3: Acquire programming skills in scripting language.
CO4: Understanding the text manipulation through Perl
CO5: Understanding of how applications communicating with each other and how a widget toolkit used for building GUI in many languages.

4CSPL3061: Kotlin (OO+ Functional) (MOOC)		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** To learn a readable, pragmatic, safe, and interoperable programming language **CO2:** To think about nullability from the start by integrating nullability into the type system **CO3:** Acquire programming skills in Kotlin **CO4:** Understanding the Android development through Kotlin **CO5:** To aid scalability in large-scale software development		

4CSPL3071: Network Programming in Unix & C		
A. Course Framework		
Credits: 3-0-0		**Syllabus Version: 1**
Contact Hours / Week: 45	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		
On successful completion of the course, students will be able to: CO1: Identify interfaces and frameworks for developing network applications. CO2: Solve the socket functions for data communication. CO3: Design TCP echo client server program. CO4: Develop UDP Client Server programs using socket functions. CO5: Analyze the difference between broadcast and multicast programs.		

4CSPL3081: Python for Networking		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		

On successful completion of the course, students will be able to:
CO1: Demonstrate the basic elements of a relational database management system.
CO2: Identify the data models for relevant problems
CO3: Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data into RDBMS and formulate SQL queries on the data.
CO4: Demonstrate their understanding of key notions of query evaluation and optimization techniques.
CO5: Extend normalization for the development of application softwares.

4CSGC3071: Client-Server Technologies		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Recognize and describe the working of Computer Networks, Client server computing. **CO2:** Illustrate reference models with layers, protocols and interfaces. **CO3:** Summarize functionalities of different Layers. **CO4:** Combine and distinguish functionalities of different Layers. **CO5:** Model the Client- Server computing using different media.		

4CSPL3061: Object Oriented Programming		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Discuss the concepts of object-oriented programming **CO2:** Apply OOP concepts to develop programs using functions and class **CO3:** Incorporate the inheritance and constructor concepts to develop applications in C++ **CO4:** Apply operator overloading concepts in C++ **CO5:** Exemplify the process of data file manipulations, templates and exception handling using C++		

4CSGC2011: Database Management Systems
A. Course Framework

Credits: 3-0-0-3		Syllabus Version: 1
Contact Hours / Week: 3	Total Contact Hours: 45	Level: 200
Course Outcomes:		

On successful completion of the course, students will be able to:

CO1: Demonstrate the basic elements of a relational database management system.
CO2: Identify the data models for relevant problems
CO3: Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data into RDBMS and formulate SQL queries on the data.
CO4: Demonstrate their understanding of key notions of query evaluation and optimization techniques.
CO5: Extend normalization for the development of application softwares.

4CSGC1021: OFFICE AUTOMATION		
A. Course Framework		
Credits: 3-0-0-3		Syllabus Version: 1
Contact Hours / Week: 45	Total Contact Hours: 45	Level: 100
Course Outcomes:		

On successful completion of the course, students will be able to:
CO1: Applying basic editing functions formatting skills on paragraphs, tables, lists, and pages
CO2: Applicable knowledge and uses of accepted business style formatting conventions.
CO3: Working knowledge of organizing and displaying large amounts and complex data
CO4: Learnt to work with Master Slides to make editing your presentation easy
CO5: Learnt the importance of web and in social media

VI SEMESTER

4CSGC2061: DATA COMMUNICATION AND COMPUTER NETWORKS		
Course Frame Work:		
Credits: L–T–P: 2–0–1		Total Credits: 3
Contact Hours/Week: 4	Direct Teaching Hours: 30	Total Contact Hours: 60

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Outline basic concepts in data communications, OSI and TCP/IP protocol stack	L2
CO2	Demonstrate design issues, flow control and error control	L2
CO3	Understand the transfer of data from source to the destination using different	L2

	protocols and addressing	
CO4	Summarize the functions of application layer protocols and how to meet the QoS requirements in networking	L2
CO5	Identify the limits and importance of compression, encoding, sampling, quantization methods	L3

4CSPL2041: INTRODUCTION TO MACHINE LEARNING		
Course Frame Work:		
Credits: L–T–P: 2–0–1		**Total Credits: 3**
Contact Hours/Week: 4	**Direct Teaching Hours: 30**	**Total Contact Hours: 60**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Apply various classification and clustering techniques for problems using tools like R and Python.	L2
CO2	Implement solutions for various prediction problems using tools.	L2
CO3	Design and development of game and traffic control system using reinforcement learning.	L2
CO4	Identify and apply the appropriate machine learning techniques for classification, Pattern recognition, optimization and decision problems.	L2
CO5	Development of techniques in information science applications by applying Computational intelligence and appropriate machine learning techniques.	L3

4CSGC2071: CLOUD COMPUTING		
Course Frame Work:		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO 1	Explain main concepts, key technologies, strengths and limitations of cloud computing	L 2
CO 2	Explain the cloud enabling technologies that help in the development of cloud	L 2

CO 3	Develop the ability to use the architecture of compute and storage cloud, service and delivery models	L 3
CO 4	Explain core issues of cloud computing such as resource management and security	L 2
CO 5	Choose the appropriate technologies and approaches for implementation and use of cloud	L 3

4CSGC2081- Software Engineering

A. Course Frame Work

Credits: L-T-P: 3 – 0 – 0 - 3		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes:

On successful completion of the course, students will be able to:

1. Explain the principles of the engineering processes in software development. (L2)
2. Develop the software projects through activities such as planning and scheduling. (L3)
3. Classify and specify the requirements for the software projects. (L2)
4. Design the prototype of the software projects. (L4)
5. Implement the software development processes activities from requirements to validation and verification. (L3)

4CSGC3121: Soft Computing (Fuzzy, Genetic, Ontologies)

A. Course Framework

Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 45**	**Level: 300**

Course Outcomes:

On successful completion of the course, students will be able to:

CO1: Students will acquire a solid comprehension of the fundamental concepts and principles that form the foundation of soft computing L4

CO2: Students will develop the ability to identify and analyze complex problems in various domains and apply soft computing techniques to devise effective solutions. L3

CO3: Students will be able to select appropriate soft computing algorithms based on problem requirements L3

CO4: Students will learn how to design and develop soft computing models by defining the problem domain. L2

CO5: Students will be able to evaluate the performance of soft computing models using appropriate evaluation metrics and statistical analysis techniques L2

4CSPL3091- No-SQL DATABASES

Course Frame Work:

Credits: L-T-P: 3 – 0 – 0-3		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes:

On successful completion of the course, students will be able to:

6. Elaborate the fundamental concepts of No-SQL databases. (L2)
7. Analyze the features and use cases of key-value databases.(L3)
8. Explain the features and challenges pertaining to document databases.(L2)
9. Illustrate the characteristics of column oriented No-SQL databases.(L4)
10. Describe the design and use cases of graph databases.(L3)

4CSPL3101: APPLIED MACHINE LEARNING		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 45**	**Level: P5**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Apply machine learning in real world projects L4 **CO2:** Analyse and apply various classification algorithms L3 **CO3:** Analyse various prediction algorithms L3 **CO4:** Elaborate the clustering algorithms L2 **CO5:**Construct machine Learning Models L2		

4CSGC3131: System Security		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Describe the knowledge about secure software system assurance and evaluation L2 **CO2:** To conduct a cyber security risk assessment L2 **CO3:** To measure the performance and troubleshoot cyber security systems L3 **CO4:** To implement cyber security solutions. L2 **CO5:** To analyze the network security L3		

4CSGC3141: Ethical Hacking	
A. Course Framework	
Credits: 3-0-0-3	**Syllabus Version: 1**

Contact Hours / Week: 3	Total Contact Hours: 45	Level:
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: Describe the basics of the ethical hacking		L2
CO2: Describe the foot printing and scanning		L2
CO3: Demonstrate the techniques and countermeasures for system hacking		L3
CO4: Characterize the malware and their attacks		L2
CO5: Analyze the hardware Security concerns		L3

4CSGC3151: Malware analysis		
Course Frame Work:		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**
Course Outcomes (COs):		
On successful completion of the course, students will be able to:		
CO1	Explain the Basic Static Techniques to get information from an executable without running it.	L1
CO2	Analyse malware in virtual machines to set up virtual machines to use as a safe environment for running malware	L2
CO3	To apply techniques for analyzing a malicious program	L2
CO4	To Analyze Malicious Windows Programs," for understanding malicious Windows programs	L3
CO5	Explain how to use malware analysis to create network signatures that outperform signatures made from captured traffic alone	L2

4CSPL3111: Object Oriented Analysis Design		
0. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 45**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to:		
CO1: To learn techniques for testing and validating object-oriented systems, including unit testing, integration testing, and acceptance testing, to ensure the correctness and reliability of the software. L1		
CO2: To develop skills in collaborating effectively within a team environment, including communication, task allocation, and version control, to collectively design and implement object-oriented systems. L5		
CO3: To understand the importance of non-functional requirements, such as performance, scalability, and security, and learn how to incorporate them into the analysis and design process. L3		
CO4: To stay updated with the latest trends and technologies in object-oriented analysis and design, allowing them to adapt and apply new techniques and tools as they evolve. L3		
CO5: To demonstrate ethical and professional behaviour in the analysis and design of software systems, considering legal and societal implications, as well as adhering to industry best practices and standards. L5		

4CSPL3121: Web Technology Frameworks		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 45**	**Level: 200**
Prerequisite: (If applicable)	**Nil**	
Course Outcomes:		

On successful completion of the course, students will be able to:

CO1: Students will be able to Develop a solid understanding of the MERN stack and how it can be used to build scalable, high-performance full-stack web applications. L1

CO2: Students will Gain hands-on experience with building web applications using the MERN stack, including setting up a development environment, creating and connecting to databases, building APIs, and integrating frontend and backend code. L5

CO3: Students will be able to learn best practices for building secure, performant, and maintainable web applications, including implementing authentication and authorization, optimizing database queries, and using tools for debugging and testing. L3

CO4:. Students will be able to understand how to design and implement scalable, distributed web applications that can handle large amounts of traffic and users, and deploy these applications to the cloud using popular cloud services. L3

CO5:. Students will be able to Acquire the skills and knowledge necessary to be able to build real-world web applications using the MERN stack and gain confidence in their ability to create high-quality, professional-grade software. L5

4CSPL3131: Application Development using MERN Stack (P5)		
Course Frame Work:		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1: To Discover the details of HTML,CSS and their properties and applications L2
CO2: Use the tools required to build JavaScript based SPAs L2
CO3: Discover the details of React, the React Way, and how to get the maximum out of this library L3
C04: Discover the details of Nodejs and how to get the maximum out of this library L3
Co5: To Discover the details of SQL,MongoDB and Nosql L2

4CSPL3141: Advanced Computer Networks		
Course Frame Work:		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes (COs):
On successful completion of the course, students will be able to:
CO1: To Understand the TCP/IP protocol suite and the working of the Internet.
L2
CO2: Form an understanding of the principles upon which the global Internet was designed.
L2
CO3: Discover the details of switching, bridges and LAN.
L3
C04: Discover the details Simple Internetworking, Internet Protocol.
L3
Co5: To Discover the details of UDP, TCP, RPC
L2

4CSGC3161: Wireless Technologies		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 45**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Students will gain a comprehensive understanding of the principles and concepts of wireless communication, including modulation, transmission, and reception of wireless signals. L1 **CO2:** Students will develop the skills necessary to design and implement wireless networks, including understanding the transmission medium, evaluating network performance, and selecting appropriate technologies. L5 **CO3:** Students will be able to analyze and evaluate wireless technologies, including understanding the limitations of different protocols and the impact of environmental factors on network performance. L3 **CO4:**. Students will learn about the legal, ethical, and social implications of wireless communication, including privacy concerns, legal regulations, and the impact of wireless technologies on society. L3 **CO5:**. Students will develop problem-solving skills through hands-on projects and laboratory exercises, including designing, implementing, and testing wireless networks and communication systems. L5		

4CSGC3171: Multimedia Networks		
Course Frame Work:		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**
Course Outcomes (COs): **On successful completion of the course, students will be able to:**		

CO1: To describe types of networks and multimedia network requirement L1
CO2: To describe end systems support for multimedia transport L2
CO3: To Describe and analyze QoS mechanisms and protocols L2
CO4:TO conduct performance analysis and discuss synchronization and adoption L3
CO5 :TO Discuss and evaluate multimedia over wireless networks. L3

4CSPL2071: Web Technology		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 45**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Students will be able to create simple static web pages using HTML and CSS. L1 **CO2:** Students will be able to add interactivity to web pages using JavaScript. L5 **CO3:** Students will be able to design responsive web pages that adapt to different screen sizes using a framework such as Bootstrap. L3 **CO4:**. Students will be able to create server-side applications using a server-side language such as PHP or Python. L3 **CO5:**. Students will be able to design and implement web applications that consume external APIs usingRESTful web services. L5		

4CSPL2051: Mobile Application Development	
A. Course Framework	
Credits: 3-0-0-3	**Syllabus Version: 1**

Contact Hours / Week: 3	Total Contact Hours: 45	Level: 2
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Explain the fundamental concepts of mobile application development L2 **CO2:** Design the application with activities and fragments L2 **CO3:** Apply different user interfaces to their application L3 **CO4:** Demonstrate the use of views and pictures L2 **CO5:** Use the different services in the application L3		

4CSGC2101 : Machine Learning for Beginners		
A. Course Framework		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 4	**Total Contact Hours: 45**	**Level: 200**
Course Outcomes:		
On successful completion of the course, students will be able to: **CO1:** Explain the concepts of Machine Learning Categories L4 **CO2:** Analyse the fundamentals of Machine Learning L3 **CO3:** Analyse various models in Machine learning L3 **CO4:** Illustrate the Text Mining and Recommender Systems L2 **CO5:** Elucidate the Deep and Reinforcement Learning L2		

VII SEMESTER

4CSGC3011: ARTIFICIAL INTELLIGENCE		
A. COURSE FRAME WORK:		
Credits: L–T–P: 3–0–0		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Elucidate the basic concepts of Artificial Intelligence	L2
CO2	Analyze Artificial Intelligence techniques, such as search algorithms, for problem solving	L4
CO3	Apply techniques of Knowledge Representation and Planning	L3
CO4	Apply knowledge of reasoning in the presence of incomplete or uncertain information	L3
CO5	Explain different forms of Learning	L2

4CSGC3021: NETWORK SECURITY		
A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 300**
Course Outcomes:		

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Explain the various concepts of Network Security	L3
CO2	Illustrate different cryptographic principles, algorithms and Message Authentication	L3
CO3	Infer the key distribution, key management issues and different cryptographic standards and certificates	L2
CO4	Interpret the various network security applications	L3
CO5	Identify fundamental notions of system security, threats, vulnerabilities, attacks, and countermeasures	L3

4CSGC3031: MOBILE APPLICATION DEVELOPMENT		
A: COURSE FRAME WORK:		
Credits: L–T–P: 2–0–1 :3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 300**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Explain the fundamental concepts of mobile application development CO2 Design responsive user interfaces that work across a wide range of devices CO3 Demonstrate the knowledge of data persistence in mobile applications	L2 L6
CO4	Outline networking and web services concepts in mobile applications	L2
CO5	Apply the steps involved in publishing mobile application to share with the world	L2 L3

4CSPL4021: DEEP LEARNING	
A: COURSE FRAME WORK:	
Credits: L–T–P: 3–0–0	**Syllabus Version: 1**

Contact Hours / Week: 3	Total Contact Hours: 45	Level: 400

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Apply concepts of RNN and LSTM	L3
CO2	Demonstrate concepts of self-organizing maps in real-world applications	L3
CO3	Illustrate problems through pre trained model such as auto-encoders	L3
CO4	Interpret about Boltzmann machines and its applications	L3
CO5	Apply the concept of GANs and know its applications	L4

4CSPL4041: ROBOTIC PROCESS AUTOMATION		
A: COURSE FRAME WORK:		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Discuss the basic classification and structure of a robot.	L3
CO2	Explain the working and applications of various sensors and actuators used in robotics.	L3
CO3	Discuss the basic classification and structure of a robot.	L3
CO4	Explain the working and applications of various sensors and actuators used in robotics.	L3

4CSPL4051: Natural Language Processing
A: COURSE FRAME WORK:

Credits: L–T–P: 3–0–0		Total Credits: 3
Contact Hours/Week: 3	Direct Teaching Hours: 45	Total Contact Hours: 45

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Analyze the natural language text.	L4
CO2	Create the natural language.	L6
CO3	Analyze text mining	L4
CO4	Evaluation of self-explanation.	L2
CO5	Apply information retrieval techniques.	L3

4CSPL4061: MOBILE COMPUTING SECURITY		
A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	To know the basics of mobile communications	L3
CO2	To Understand different architectures of mobile computing	L3
CO3	To know about the working of mobile IP and data management	L2
CO4	To gain knowledge on wireless security in WLAN	L3
CO5	To know about internet security protocols and its applications	L2

4CSPL4071: DIGITAL FORENSICS		
A: COURSE FRAME WORK:		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Explain the fundamentals of digital forensics	L2
CO2	Apply computer forensic techniques to identify the digital fingerprints associated with criminal activities	L3
CO3	Apply forensic analysis tools to understand mobile device forensics	L3
CO4	Apply forensic analysis tools to understand cloud forensics	L3
CO5	Analyze email and social media investigations, laws and ethics involved in cybercrime	L4

4CSPL4081: CLOUD COMPUTING SECURITY		
A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	To know the basics of mobile communications	L3
CO2	To Understand different architectures of mobile computing	L3
CO3	To know about the working of mobile IP and data management	L2
CO4	To gain knowledge on wireless security in WLAN	L3
CO5	To understand the web-based application in WLAN	L2

4CSPL4091: WEB SECURITY		
A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		

Course Outcomes (COs):		
On successful completion of the course, students will be able to:		
CO1	Understand basic web security terminology and concepts.	L 3
CO2	Apply input validation and sanitization to mitigate injection attacks.	L 3
CO3	Understand the importance of multi-factor authentication (MFA) for enhancing security.	L 2
CO4	Explain the principles of encryption, hashing, and digital signatures.	L3
CO5	Identify and analyze emerging threats and attack vectors targeting web applications.	L3

4CSPL4101: J2EE TECHNOLOGIES		
A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 400**
Course Outcomes:		

Course Outcomes (COs):		
On successful completion of the course, students will be able to:		
CO1	Acquire knowledge of advanced topics such as frameworks like Spring and Hibernate, security, and performance tuning in J2EE applications.	L3
CO2	Understand XML and Web Services.	L3
CO3	Develop dynamic web applications using Servlets and JSP, implementing session management techniques.	L2
CO4	Gain a comprehensive understanding of J2EE architecture and components.	L3
CO5	Understand the J2EE applications	L2

4CSPL4111: .NET TECHNOLOGIES		
A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 400**
Course Outcomes:		

Course Outcomes (COs):		
On successful completion of the course, students will be able to:		
CO1	Students will be able to develop dynamic web applications using ASP.NET Web	L3 Forms.
CO2	Understand the lifecycle of web forms, utilize server controls.	L3
CO3	Students will gain a comprehensive understanding of the .NET Framework architecture.	L2
CO4	Understand the separation of concerns, build controllers and views, perform binding and validation	L3 model
CO5	Gain the knowledge about .NET applications and OWASP	L2

4CSPL4121: JAVASCRIPT		
A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes:		

Course Outcomes (COs):		
On successful completion of the course, students will be able to:		
CO1	Write programs in PHP language for server-side scripting	L 3
CO2	To Understand XML and processing of XML Data with Java	L 3
CO3	To Develop server-side programming using JSP	L 3
CO4	To develop the programs of client-side scripting using JavaScript	L 2
CO5	Use AJAX with PHP and MySQL.	L3 L3

4CSPL4131: MICROSERVICES	
A: COURSE FRAME WORK	
Credits: L–T–P: 3–0–0	**Total Credits: 3**

Contact Hours/Week: 3	Direct Teaching Hours: 45	Total Contact Hours: 45

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Explain the foundations and concepts of service-based computing	L2
CO2	Illustrate the basic operational model of web services	L2
CO3	Analyze key technologies in the service-oriented computing arena.	L4
CO4	Build the web service framework with respect to SOA.	L3
CO5	Develop web services using SOA	L3

4CSPL4141: SOFTWARE DEFINED NETWORKS		
A: COURSE FRAMEWORK		
Credits: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3:0:0	**Total Contact Hours: 45**	**Level: 100**

Course Outcomes:

On successful completion of the course, students will be able to:

CO1	Describe the benefits of SDN by the separation of data and control planes	L3
CO2	Discuss SDN controllers and application model	L3
CO3	Compare traditional networks and software defined networks	L2
CO4	Employ software programs to perform varying and complex networking tasks	L3
CO5	Solve real world problems using SDN and Describe various technologies in Data center	L3

4CSPL4151: STORAGE AREA NETWORKS	
A: COURSE FRAME WORK	
Credits: L–T–P: 3–0–0	**Total Credits: 3**

Contact Hours/Week: 3	Direct Teaching Hours: 45	Total Contact Hours: 45

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Explain basic concepts for Storage systems	L2
CO2	Apply the concepts of storage networking technologies	L3
CO3	Explain the concepts in Backup, Archive and Replication	L2
CO4	Analyze the concepts of cloud computing and virtualization	L4
CO5	Explain various concepts in managing and securing storage infrastructure	L2

4CSPL4161: VIRTUALIZATION & CLOUD COMPUTING		
A: COURSE FRAME WORK		
Credits: L–T–P: 3–0–0		**Total Credits: 3**
Contact Hours/Week: 3	**Direct Teaching Hours: 45**	**Total Contact Hours: 45**

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1	Discuss the features of different distributed and cloud computing technologies such as cluster computers, coordinated computers, peer-to- peer systems and parallel and distributed computing models	L2
CO2	Explain the features of virtualization middleware such as VMM and Hypervisor	L3
CO3	Describe full virtualization and para virtualization	L2
CO4	Discuss different aspects of cloud security including security defense strategies, distributed intrusion detection, and cloud security software	L4
CO5	Apply the knowledge on AWS and Microsoft Azure to set up simple cloud-based applications and services	L2

4CSPL4171: NETWORK ADMINISTRATION
A: COURSE FRAME WORK

Credits: L–T–P: 3–0–0		Total Credits: 3
Contact Hours/Week: 3	Direct Teaching Hours: 45	Total Contact Hours: 45

Course Outcomes (COs):

On successful completion of the course, students will be able to:

CO1 Discuss the features of different distributed and cloud computing technologies such as cluster computers, coordinated computers, peer-to-peer systems and parallel and distributed computing models — L2

CO2 Explain the features of virtualization middleware such as VMM and Hypervisor — L3

CO3 Describe full virtualization and para virtualization — L2

CO4 Discuss different aspects of cloud security including security defence strategies, distributed intrusion detection, and cloud security software — L4

CO5 Apply the knowledge on AWS and Microsoft Azure to set up simple cloud-based applications and services — L2

6IDSS1031: BASICS OF ENTREPRENEURSHIP		
A. Course Framework		
Credits: L-T-P-C: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: Take risk to start a new enterprise and can help the established business. (Level 4) **CO2**: Identify the elements of success of entrepreneurial ventures. (Level 2) **CO3**: Consider the legal and financial conditions for starting a business venture. (Level 2) **CO4**: Analyse the business environment in order to identify business opportunities.(Level 3) **CO5**: Interpret their own business plan. (Level 4)		

6IDSS1051: FINANCE FOR NON-FINANCE STUDENTS		
A. Course Framework		
Credits: L-T-P-C: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: Impart the time value of money in valuation of securities. (Level 3) **CO2:** Understand and focus on financial discipline and capital structure in organisations. (Level 3)		

CO3: Appreciate new methods of financing, investing, operating and business decisions. (Level 3) **CO4:** Assess appropriate measures related to dividend decisions in organisations. (Level 4)

6IDSS1071: MARKETING -FOR THE UNINITIATED		
A. **Course Framework**		
Credits: L-T-P-C: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: Understand the basic concepts of marketing. (Level 2) **CO2**: Analyze market segment and target market. (Level 4) **CO3**: Evaluate the marketing mix to make effective marketing decisions. (Level 6) **CO4**: Apply the necessary marketing skills. (Level 3) **CO5**: Analyse the IMC and recent trends. (Level 4)		

3IDSS1031: Introduction to Taxation		
A. Course Framework		
Credits: L-T-P-C: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: Acquire the complete knowledge of basic concepts of income tax. (Level 1) **CO2 & CO3:** Apply the provisions and compute income under different heads. (Level 2) **CO4**: Identify and comply with the relevant Income from other Sources and Set-off and carry Forward of Losses. (Level 3) **CO5**: Equip basics of goods and service tax (Level 4)		

3IDSS1071: Financial Markets and Personal Investment		
A. Course Framework		
Credits: L-T-P-C: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**

Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: Able to understand the concepts of financial markets and personal investment. (Level 1) **CO2**: Able to analyze the existence of different types of financial markets and their relative importance. (Level 3) **CO3**: Able to assess the need and importance of the issue of IPO. **CO4**: Able to judge the process of operations in secondary markets and the existence of different regulatory authorities in stock market operations (Level 3) **CO5**: Able to make assessments and make investment in personal investment in their life. (Level 4)		

5IDSS1011: Essentials of Human Rights and Public Interest Laws		
A. Course Framework		
Credits: L-T-P-C: 3-0-0-3		**SyllabusVersion: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: Understand core concepts involved in evolution and development of human rights law. (Level 2) **CO2**: Understand constitutional aspects of human rights along with the statutory framework of National and State Human Rights Commissions(Level 3) **CO3**: Examine the various dimensions of human rights law and understand the role of state on issues relating to the enforcement of human rights (Level 4)		

7IDSS1021: Personality Development		
A. Course Framework		
Credits: L-T-P-C: 3-0-0-3		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: Understand how personality of an individual develops (Level 2)		

CO2: Apply their knowledge on personality development to make themselves better individuals (Level 4)

NIDSS1041: NCC IV		
A. Course Framework		
Credits: L-T-P-C: 4-0-3-7(4 credits for Course & 3 credits for Camp)		**Syllabus Version: 1**
Contact Hours / Week: 3	**Total Contact Hours: 60**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: To understand, apply and practically explore the knowledge of community service and socio-political consciousness they acquired from this paper during camps and field works. (L1/L2) **CO2:** To practice a regimented way of life of the armed force in their trainings and ensure maximum benefits to the students and the society. (L1/L3) **CO3:** The cadets will employ and engage in practicing disciplined routines such as cleaning and maintaining their line area, organizing security in and around the camp, making part of the purchase committee, organizing the mess and distribution of food, etc. (L5/L6) **CO4:** The cadets will understand and develop specified skill sets such as problem solving, decision making, critical thinking, team work, etc. to address real life problems and prescribe practical solution; the students will understand the process of decision analysis (L2/L3/L5/L6)		

NIDSS1021: NCC II		
A. Course Framework		
STE 2022-26 **Credits: L-T-P-C: 2-0-3-5 (2 credits for Theory & 3 credits for Camp)**		**Syllabus Version: 1**
Contact Hours / Week: 2	**Total Contact Hours: 45**	**Level: 100**
Course Outcomes: On successful completion of the course, Students will be able to,		
CO1: To understand, apply and practically explore the knowledge of community service and socio-political consciousness they acquired from this paper during camps and field works. (L1/L2) **CO2:** To practice a regimented way of life of the armed force in their training and ensure maximum benefits to the students and the society. (L1/L3) **CO3:** The cadets will employ and engage in practicing disciplined routines such as cleaning and maintaining their line area, organizing security in and around the camp, making part of the purchase committee, organizing the mess and distribution of food, etc. (L5/L6) **CO4:** The cadets will understand and develop specific skill sets such as problem solving, decision making, critical thinking, team work, etc. to address real life problems and prescribe practical solution; the students will understand the process of decision analysis (L2/L3/L5/L6)		

VIII SEMESTER

4CAPS4010: CAPSTONE PROJECT PHASE II		
Course Frame Work:		
Credits: L–T–P: 0–0–8		**Total Credits: 8**
Contact Hours/Week: 8	**Direct Teaching Hours: 0**	**Total Contact Hours: 120**

Course Outcomes	**(COs):On successful completion of the course, students will be able to:**	
CO1	Compare the project built with other possible existing solutions to come to a conclusion about its feasibility and reliability	L4
CO2	Utilize proper project management techniques and planning methods to produce cost effective projects	L3
CO3	Recommend the need to implementing the project with supporting justification and possible areas to improve it and compile a clear report containing the step by step process of building the project that includes all calculations, analysis and fabrication methods involved	L5
CO4	Build the real-world implementation of the design that will realize the objectives of the prototype/ design	L6
CO5	Demonstrate working in groups taking leadership role and communicating effectively	L2