SecondYearofComputerEngineering

SemesterIII

Course Code	Course Name	*CourseOutcomes*
210241	**Discrete Mathematics**	**CO1:Formulate** problems precisely,solve the problems,apply formal proof techniques,and explain reasoning clearly. **CO2:Apply**appropriatemathematicalconceptsandskillstosolveproblemsinbothfamiliarandunfamiliar situations includingthoseinreal-life contexts. **CO3:Designandanalyze**realworldengineeringproblemsbyapplyingset theory,propositionallogicandtoconstruct proofsusingmathematicalinduction. **CO4:Specify,manipulateandapply**equivalencerelations;constructand usefunctionsandapplytheseconceptstosolvenew problems. **CO5:Calculate**numbersofpossibleoutcomesusingpermutationsandcombinations;tomodelandanalyzecomputationalprocessesusing combinatorics. **CO6:Modelandsolve**computingproblemusingtreeandgraphandsolve problemsusingappropriate algorithms. **CO7:Analyze** The properties of binary operations,apply abstract algebra in coding theory and evaluate the algebraic structures**.**
210242	**Fundamentals of Data Structures**	**CO1: Design** the algorithms to solve the programming problems, **identify** appropriate algorithmic strategies for specific applications,and analyze the time and space complexity. **CO2: Discriminate** the usage of various structures, **Design/Program/Implement** the appropriatedatastructures;usetheminimplementationsofabstractdatatypesandIdentitytheappropriatedatastructureinapproachingtheproblemsolution. **CO3: Demonstrate** use of sequential data structures- Array and Linked lists to store and processdata. **CO4:** **Understand**thecomputationalefficiencyoftheprincipalalgorithmsforsearchingandsortingandchoosethemostefficientonefortheapplication. **CO5:Compare**and**contrast**differentimplementationsofdatastructures(dynamic and static). **CO6: Understand, Implement and apply** principles of data structures-stack and queue to solve computational problems.

210243	**Object OrientedProgramming(OOP)**	**CO1:Apply Constructs-sequence**,selection and iteration;classes objects,inheritance,use predefined classes for libraries while developing software. **CO2:Design**object-orientedsolutionsforsmallsystemsinvolvingmultipleobjects. **CO3: Use** virtual and complex programming situations. **CO4: Apply Object-oriented software principles in problem** solving. **CO5:Analyze** the strengths of object-oriented programming. **CO6:Develop**theapplicationusingobjectorientedprogramminglanguage(C++).
210244	**Computer Graphics**	**CO1:Identify**thebasicterminologiesofComputerGraphicsandinterpretthemathematicalfoundationoftheconceptsofcomputergraphics. **CO2:Apply**mathematicstodevelopComputerprogramsforelementarygraphicoperations. **CO3:Illustrate**theconceptsof windowingandclippingand**apply**variousalgorithmstofillandclippolygons. **CO4:Understand**and**apply**thecoreconceptsofcomputergraphics,including transformationintwo and three dimensions,viewing andprojection. **CO5:Understand** the concepts of color models,lighting,shading model and hidden surface elimination. **CO6:Create Effective Programs Using Concepts Of** curves,fractals,animation gaming.
210245	**Digital Electronics and Logic Design**	**CO1:Simplify** Boolean Expressions using K Map. **CO2:Design And Implement** combinational circuits. **CO3:Design And Implement Sequential Circuits**. **CO4:Develop** simplereal-worldapplicationusingASMandPLD. **CO5:** **DifferentiateandChoose**appropriatelogicfamiliesICpackagesasperthegivendesignspecifications. **CO6:Explain Organization And Architecture Of Computer System**

210246	**Data Structures Laboratory**	**CO1: Use** algorithms on various linear data structure using sequential organization to solve real life problems. **CO2:Analyze**problemsto**apply**suitablesearchingandsortingalgorithm tovariousapplications. **CO3:Analyze**problemsto**usevariantsof**linkedlistandsolvevariousreallifeproblems. **CO4:** Designingandimplementdatastructuresandalgorithmsforsolvingdifferentkindsofproblems.
210247	**OOP and Computer Graphics Laboratory**	**CO1:**U**nderstand**and**apply**theconceptslikeinheritance,polymorphism,exceptionhandlingandgenericstructuresforimplementing reusableprogrammingcodes. **CO2:Analyze**theconceptoffileand**apply**itwhilestoringandretrievingthedatafromsecondarystorages. **CO3: Analyze**and**apply**computergraphicsalgorithmsforline-circledrawing,scanconversionandfilling withthehelpofobjectoriented programmingconcepts. **CO4: Understand** the concept of windowing and clipping and apply various algorithms to fill andclip polygons. **CO5:Apply**logictoimplement,curves,fractals,animation gaming programs.
210248	**DigitalElectronics Laboratory**	CO1:**Understand**theworkingofdigitalelectroniccircuits. CO2:**Apply**theknowledgetoappropriateICasperthedesignspecifications. CO3:**Design** and **implement** Sequential and Combinational digital circuits as per the specifications.
210249	**Business Communication Skills**	**CO1:Express** effectively through verbal/oral communication and improve listening skills **CO2:Write** precise briefs or reports and technical documents. **CO3:Prepare** for group discussion /meetings/interviews and presentations. **CO4:Explore** goal/target setting,self-motivation and practicing creative thinking. **CO5: Operate**effectivelyinmulti-disciplinaryandheterogeneousteamsthroughtheknowledgeofteamwork,Inter-personalrelationships,conflictmanagementandleadershipqualities.

210250	**Humanity and Social Science**	**CO1: Aware Of The Various Issues Concerning Humans And Society**. **CO2: Aware About Their Responsibilities Towards Society**. **CO3:** Sensitized about broader issues regarding the social,cultural,economic and human aspects,involved in social changes. **CO4: Able** to understand the nature of the individual and the relationship between self and the community. **CO5:** **Able**tounderstandmajorideas,values,beliefs,andexperiences thathaveshapedhumanhistoryandcultures.
		SemesterIV
207003	**Engineering Mathematics III**	CO1:SolveLineardifferentialequations,essential in modellingand design computer-based systems. CO2:ApplyconceptofFouriertransformandZ-transformanditsapplicationstocontinuousanddiscretesystems andimageprocessing. CO3:ApplyStatisticalmethodslikecorrelationandregressionanalysisa ndprobabilitytheoryfordataanalysis andpredictions in machinelearning. CO4:SolveAlgebraicandTranscendentalequationsandSystemoflinea requationsusingnumericaltechniques. CO5:ObtainInterpolatingpolynomials,numericaldifferentiationandi ntegration,numericalsolutionsofordinarydifferential equationsusedin modern scientificcomputing.
210252	**Data Structures and Algorithms**	CO1:**Identifyandarticulate**thecomplexitygoalsandbenefitsofagood hashingschemeforreal-world applications. CO2:**Apply**non-lineardatastructuresforsolvingproblemsofvariousdomain. CO3:**Designandspecify**theoperationsofanonlinear-basedabstractdatatypeandimplementthemin a high-level programming language. CO4:**Analyze**thealgorithmicsolutionsforresourcerequirementsando ptimization CO5:**Use**efficientindexingmethodsandmultiwaysearchtechniquesto storeand maintaindata. CO6:U**se**appropriatemoderntoolstounderstandandanalyzethefunct ionalitiesconfinedtothesecondarystorage.

210253	**Software Engineering**	**CO1:Analyze**softwarerequirementsandformulatedesignsolutionfora software. **CO2: Design** applicable solutions in one or more application domains using software engineering approaches that integrate ethical,social,legal and economic concerns. **CO3:Apply**newsoftwaremodels,techniquesandtechnologiestobring outinnovativeandnovelisticsolutionsforthegrowthofthesocietyi nallaspectsandevolvingintotheircontinuousprofessionaldevelo pment. **CO4:Model** anddesignUserinterfaceandcomponent-level. **CO5:Identify**andhandleriskmanagementandsoftwareconfiguration management. **CO6:Utilize Knowledge Software Testing Approaches**,approaches verification and validation. **CO7: Construct** software of high quality – software that is reliable, and that is reasonably easy to understand,modify and maintain efficient,reliable,robust and cost-effective software solutions.
210254	**Microprocessor**	**CO1:E**xhibit skill of assembly language programming for the application. **CO2:Classify**Processorarchitectures. **CO3:Illustrate advanced features of 80386 Microprocessor**. **CO4:Compare And Contrast Different Processor Modes**. **CO5:Use Interrupt Mechanism In Applications** **CO6:Differentiate**betweenMicroprocessorsandMicrocontrollers. **CO7:Identify**and**analyze**thetoolsandtechniquesusedtodesign,imple ment,anddebugmicroprocessor-based systems.
210255	**Principles of Programming Languages**	CO1:**Makeuseof Basic Principles Of Programming Languages**. CO2:**Develop**aprogramwithDatarepresentationandComputations. CO3:**Develop** programs using Object Oriented Programming language : Java. CO4:**Develop Application Using Inheritance**,encapsulation,and polymorphism. CO5:**Demonstrate** Multithreading For Robust Application Development. CO6:**Develop**asimpleprogramusingbasicconceptsofFunctionalandL ogicalprogrammingparadigm.

210256	**Data Structures and Algorithms Laboratory**	**CO1:Understand**theADT/libraries,hashtablesanddictionarytodesignalgorithmsforaspecificproblem. **CO2:**Choosemostappropriatedatastructuresand**apply**algorithmsforgraphicalsolutionsoftheproblems. **CO3:Apply And Analyze** nonlinear datastructurestosolverealworld complex problems. **CO4:Apply** and **analyze** algorithm design techniques for indexing, sorting, multi-way searching,file organization and compression. **CO5:Analyze** the The efficiency most appropriate data structure for creating efficient
210257	**Microprocessor Laboratory**	CO1.**Understand**and**apply**variousaddressingmodesandinstructionsettoimplementassemblylanguageprograms CO2.Apply Logic To Implement code conversion CO3.**Analyze** and **apply** logic to **demonstrate processor mode of operation**
210258	**Project Based Learning II**	**CO1:**Identify The Real Life problem from societal need point of view **CO2:**Chooseandcomparealternativeapproachestoselectmostfeasible one **CO3:**Analyzeandsynthesizetheidentifiedproblemfromtechnologicalperspective **CO4:**Designthereliableandscalablesolutiontomeetchallenges **CO5:**Evaluate The Solution Based On The Criteria Specified **CO6:**Inculcatelonglifelearningattitudetowardsthesocietalproblems
210259	**Code of Conduct**	**CO1: Understand** the basic perception of profession, professional ethics, various moral and social issues, industrial standards, code of ethics and role of professional ethics in engineering field. **CO2:** **Aware**ofprofessionalrightsandresponsibilitiesofanengineer,responsibilitiesofanengineerforsafety andriskbenefitanalysis. **CO3:** **Understand**theimpactoftheprofessionalEngineeringsolutionsinsocietalandEnvironmentalcontexts,anddemonstratetheknowledgeof,andneedforsustainabledevelopment. **CO4:Acquire** knowledge about various roles of engineers in a variety of global issues and able to apply ethical principlesto resolvesituationsthatarise intheirprofessionallives.

Third Year of Computer Engineering		
SemesterV		
Course Code	**Course Name**	***CourseOutcomes***
310241	**Database Management Systems**	CO1:Analyze and design Database Management System using ER model CO2: Implement database queries using database languages CO3: Normalize the database design using normal forms CO4:Apply Transaction Management concepts in real-time situations CO5: Use NoSQL databases for processing unstructured data CO6: Differentiate between Complex Data Types and analyze the use of appropriate data types
310242	**Theory of Computation**	CO1: Understand formal language, translation logic, essentials of translation, alphabets, language representation and apply it to design Finite Automata and its variants CO2: Construct regular expression to present regular language and understand pumping lemma for RE CO3: Design Context Free Grammars and learn to simplify the grammar CO4: Construct Pushdown Automaton model for the Context Free Language CO5: Design Turing Machine for the different requirements outlined by theoretical computer science CO6: Understand different classes of problems, classify and analyze them and study concepts of NP completeness

310243	**Systems Programming and Operating System**	CO1: Analyze and synthesize basic System Software and its functionality. CO2: Identify suitable data structures and Design & Implement various System Software CO3: Compare different loading schemes and analyze the performance of linker and loader CO4: Implement and Analyze the performance of process scheduling algorithms CO5: Identify the mechanism to deal with deadlock and concurrency issues CO6: Demonstrate memory organization and memory management policies
310244	**Computer Networks and Security**	CO1: Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies CO2: Illustrate the working and functions of data link layer CO3: Analyze the working of different routing protocols and mechanisms CO4: Implement client-server applications using sockets CO5: Illustrate role of application layer with its protocols, client-server architectures CO6: Comprehend the basics of Network Security
310246	**Database Management Systems Laboratory**	CO1: Design E-R Model for given requirements and convert the same into database tables CO2: Design schema in appropriate normal form considering actual requirements CO3: Implement SQL queries for given requirements , using different SQL concepts CO4: Implement PL/SQL Code block for given requirements CO5: Implement NoSQL queries using MongoDB CO6: Design and develop application considering actual requirements and using database concepts

310247	**Computer Networks and Security Laboratory**	CO1: Analyze the requirements of network types, topology and transmission media CO2: Demonstrate error control, flow control techniques and protocols and analyze them CO3: Demonstrate the subnet formation with IP allocation mechanism and apply various routing algorithms CO4: Develop Client-Server architectures and prototypes CO5: Implement web applications and services using application layer protocols CO6: Use network security services and mechanisms

310248	**Laboratory Practice I**	**Systems Programming and Operating System** CO1: Implement language translators CO2: Use tools like LEX and YACC CO3: Implement internals and functionalities of Operating System **Internet of Things and Embedded Systems** CO4: Design IoT and Embedded Systems based application CO5: Develop smart applications using IoT CO6:Develop IoT applications based on cloud environment OR **Human Computer Interface** CO4: Implement the interactive designs for feasible data search and retrieval CO5: Analyze the scope of HCI in various paradigms like ubiquitous computing, virtual reality, multi-media, World wide web related environments CO6: Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems OR **Distributed Systems** CO4: Demonstrate knowledge of the core concepts and techniques in Distributed Systems CO5: Apply the principles of state-of-the-Art Distributed Systems in real time applications CO6: Design, build and test application programs on Distributed Systems OR **Software Project Management** CO4: Apply Software Project Management tools CO5: Implement software project planning and scheduling CO6: Analyze staffing in software project
310249	**Seminar and Technical Communication**	CO1: Analyze a latest topic of professional interest CO2: Enhance technical writing skills CO3: Identify an engineering problem, analyze it and propose a work plan to solve it CO4: Communicate with professional technical presentation skills

SemesterVI

310251	**Data Science and Big Data Analytics**	CO1: Analyze needs and challenges for Data Science Big Data Analytics CO2: Apply statistics for Big Data Analytics CO3: Apply the lifecycle of Big Data analytics to real world problems CO4: Implement Big Data Analytics using Python programming CO5: Implement data visualization using visualization tools in Python programming CO6: Design and implement Big Databases using the Hadoop ecosystem
310252	**Web Technology**	CO1: Implement and analyze behavior of web pages using HTML and CSS CO2: Apply the client side technologies for web development CO3: Analyze the concepts of Servlet and JSP CO4: Analyze the Web services and frameworks CO5: Apply the server side technologies for web development CO6: Create the effective web applications for business functionalities using latest web development platforms
310253	**Artificial Intelligence**	CO1: Identify and apply suitable Intelligent agents for various AI applications CO2: Build smart system using different informed search / uninformed search or heuristic approaches CO3: Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem CO4: Apply the suitable algorithms to solve AI problems CO5: Implement ideas underlying modern logical inference systems CO6: Represent complex problems with expressive yet carefully constrained language of representation

310255	**Internship**	CO1:To demonstrate professional competence through industry internship. CO2:To apply knowledge gained through internships to complete academic activities in a professional manner. CO3: To choose appropriate technology and tools to solve given problem. CO4: To demonstrate abilities of a responsible professional and use ethical practices in day to day life. CO5: Creating network and social circle, and developing relationships with industry people. CO6: To analyze various career opportunities and decide carrier goals
310256	**Data Science and Big Data Analytics Laboratory**	CO1: Apply principles of Data Science for the analysis of real time problems CO2: Implement data representation using statistical methods CO3: Implement and evaluate data analytics algorithms CO4: Perform text preprocessing CO5: Implement data visualization techniques CO6: Use cutting edge tools and technologies to analyze Big Data
310257	**Web Technology Laboratory**	CO1: Understand the importance of website planning and website design issues CO2: Apply the client side and server side technologies for web application development CO3: Analyze the web technology languages, frameworks and services CO4: Create three tier web based applications

310258	**Laboratory Practice II**	**Artificial Intelligence** CO1: Design system using different informed search / uninformed search or heuristic approaches CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning CO3: Design and develop an expert system **Information Security** CO4: Use tools and techniques in the area of Information Security CO5: Use the knowledge of security for problem solving CO6: Apply the concepts of Information Security to design and develop applications OR **Augmented and Virtual Reality** CO4: Use tools and techniques in the area of Augmented and Virtual Reality CO5: Use the knowledge of Augmented and Virtual Reality for problem solving CO6: Apply the concepts of Augmented and Virtual Reality to design and develop applications OR **Cloud Computing** CO4: Use tools and techniques in the area of Cloud Computing CO5: Use the knowledge of Cloud Computing for problem solving CO6: Apply the concepts Cloud Computing to design and develop applications OR **Software Modelling and Architectures** CO4: Use tools and techniques in the area Software Modelling and Architectures CO5: Use the knowledge of Software Modelling and Architectures for problem solving CO6: Apply the concepts Software Modelling and Architectures to design and develop applications

Fourth Year of Computer Engineering		
SemesterVII		
Course Code	**Course Name**	***CourseOutcomes***
410241	**Design and Analysis of Algorithms**	CO1: Formulate the problem CO2: Analyze the asymptotic performance of algorithms CO3: Decide and apply algorithmic strategies to solve given problem CO4: Find optimal solution by applying various methods CO5: Analyze and Apply Scheduling and Sorting Algorithms. CO6: Solve problems for multi-core or distributed or concurrent environments

410242	**Machine Learning**	CO1: Identify the needs and challenges of machine learning for real time applications. CO2: Apply various data pre-processing techniques to simplify and speed up machine learning algorithms. CO3: Select and apply appropriately supervised machine learning algorithms for real time applications. CO4: Implement variants of multi-class classifier and measure its performance. CO5 :Compare and contrast different clustering algorithms. CO6: Design a neural network for solving engineering problems
410243	**Blockchain Technology**	CO1: Interpret the fundamentals and basic concepts in Blockchain CO2: Compare the working of different blockchain platforms CO3: Use Crypto wallet for cryptocurrency based transactions CO4: Analyze the importance of blockchain in finding the solution to the real-world problems. CO5: Illustrate the Ethereum public block chain platform CO6: Identify relative application where block chain technology can be effectively used and implemented.
410246	**Laboratory Practice III**	CO1: Apply preprocessing techniques on datasets. CO2: Implement and evaluate linear regression and random forest regression models. CO3: Apply and evaluate classification and clustering techniques. CO4: Analyze performance of an algorithm. CO5: Implement an algorithm that follows one of the following algorithm design strategies: divide and conquer, greedy, dynamic programming, backtracking, branch and bound. CO6: Interpret the basic concepts in Blockchain technology and its applications

410247	**Laboratory Practice IV**	CO1: Apply android application development for solving real life problems CO2: Design and develop system using various multimedia components. CO3: Identify various vulnerabilities and demonstrate using various tools. CO4: Apply information retrieval tools for natural language processing CO5: Develop an application using open source GPU programming languages CO6: Apply software testing tools to perform automated testing
410248	**Project Stage I**	CO1:Solve real life problems by applying knowledge. CO2: Analyze alternative approaches, apply and use the most appropriate one for a feasible solution. CO3: Write precise reports and technical documents in a nutshell. CO4: Participate effectively in multi-disciplinary and heterogeneous teams exhibiting teamwork CO5:Interpersonal relationships, conflict management and leadership quality.
SemesterVIII		
410250	**High Performance Computing**	CO1: Understand various Parallel Paradigm CO2: Design and Develop an efficient parallel algorithm to solve given problem CO3: Illustrate data communication operations on various parallel architecture CO4: Analyze and measure performance of modern parallel computing systems CO5: Apply CUDA architecture for parallel programming CO6: Analyze the performance of HPC applications

410251	**Deep Learning**	CO1: Understand the basics of Deep Learning and apply the tools to implement deep learning applications CO2: Evaluate the performance of deep learning models (e.g., with respect to the bias-variance tradeoff, overfitting and underfitting, estimation of test error). CO3: To apply the technique of Convolution (CNN) and Recurrent Neural Network (RNN) for implementing Deep Learning models CO4: To implement and apply deep generative models. CO5: Construct and apply on-policy reinforcement learning algorithms CO6:To Understand Reinforcement Learning Process
410254	**Laboratory Practice V**	CO1: Analyze and measure performance of sequential and parallel algorithms. CO2: Design and Implement solutions for multicore/Distributed/parallel environment. CO3: Identify and apply the suitable algorithms to solve AI/ML problems. CO4: Apply the technique of Deep Neural network for implementing Linear regression and classification. CO5: Apply the technique of Convolution (CNN) for implementing Deep Learning models. CO6: Design and develop Recurrent Neural Network (RNN) for prediction
410255	**Laboratory Practice VI**	CO1: Apply basic principles of elective subjects to problem solving and modeling. CO2: Use tools and techniques in the area of software development to build mini projects CO3: Design and develop applications on subjects of their choice. CO4: Generate and manage deployment, administration & security.
410256	**Project Stage I**	CO1: Show evidence of independent investigation CO2: Critically analyze the results and their interpretation. CO3: Report and present the original results in an orderly way and placing the open questions in the right perspective. CO4: Link techniques and results from literature as well as actual research and future research lines with the research. CO5: Appreciate practical implications and constraints of the specialist subject