



# ACHARYA INSTITUTE OF TECHNOLOGY

Affiliated to Visvesvaraya Technological University, Belagavi,  
Approved by AICTE, New Delhi, Recognized by Govt. of Karnataka and  
Accredited by NBA (AE, BT, CSE, ECE, ME, MT)

## DEPARTMENT OF INFORMATION SCIENCE ENGINEERING

### 2022 SCHEME

Course Name	Course Code	CO. No.	Course Outcomes
MATHEMATICS FOR COMPUTER SCIENCE	BCS301	CO1	Students will be able to apply the properties and characteristics of the probability distribution to the real-world problems.
		CO2	Students are able to calculate covariance and correlation coefficients between two random variables and the behavior of Markov chains over multiple time steps.
		CO3	Examine testing of hypothesis, level of significance and confidence limits to large samples.
		CO4	Determine critical values and probabilities using the t-distribution, F-distribution and goodness of fit by Chi – square distribution.
		CO5	Apply one-way ANOVA and two-way ANOVA to datasets with multiple factors in the relevant field.
DIGITAL DESIGN & COMPUTER ORGANIZATION	BCS302	CO1	Apply the various Boolean algebraic and K-Map simplification techniques to obtain simplified logical expressions
		CO2	Design different types of basic level combinational and sequential circuits for the given specification
		CO3	Describe the fundamentals of machine instructions, addressing modes and Processor performance
		CO4	Explain the approaches involved in achieving communication between processor and I/O devices.
		CO5	Paraphrase internal Organization of control unit and Impact of cache/Pipelining on Processor Performance.
OPERATING SYSTEMS	BCS303	CO1	Describe the structure, functionality and services of operating system
		CO2	Apply appropriate CPU scheduling algorithms to evaluate its performance metrics
		CO3	Illustrate the various techniques for process synchronization and deadlock handling
		CO4	Apply the various page replacement algorithms for memory management.
		CO5	Explain the file and secondary storage management strategies for principles of protection



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DATA STRUCTURE AND APPLICATION S	BCS304	CO1	Apply Arrays, structures and Stacks to solve a given problem using C programming language.
		CO2	Use different types of queues and linked list to organize the data linearly.
		CO3	Illustrate the different operations on linked list and trees to enhance the traversing and searching techniques.
		CO4	Implement the nonlinear data structure such as Trees and Graphs for performing the appropriate operations.
		CO5	Explain the advanced Data structures concepts such as Hashing Techniques and optimal Binary search tree for sorting and searching the data.
DATA STRUCTURE LAB	BCSL305	CO1	Implement the Linear data structures for organizing and performing various operations on Data stored
		CO2	Demonstrate the Non Linear data structures for organizing and performing various operations on Data stored.
OOP WITH JAVA	BCS306A	CO1	Describe the basic constructs of Java programming
		CO2	Illustrate the concepts of classes, Methods and constructors in JAVA for a given scenario.
		CO3	Apply the concepts of inheritance and interfaces to form reusable classes.
		CO4	Describe the concept of packages and Exception handling in java.
		CO5	Apply the concepts of multithreading, autoboxing and enumerations for handling multitasking.
OOP WITH C++	BCS306B	CO1	Describe & Implement the fundamental concepts of object-oriented programming in C++
		CO2	Discuss & Demonstrate the concept of Pointers, Dynamic memory allocation & function overloading
		CO3	Implement and Analyse the concept of Polymorphism and Inheritance
		CO4	Implement the concept of dynamic polymorphism & templates (class & functions)
SOCIAL CONNECT & RESPONSIBILIT Y	BSCK307	CO1	Understand social responsibility and ethics towards mankind and environment



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		CO2	Practice sustainability and creativity to have an impact on the society.
		CO3	Exhibit planning and organizational skills in a given platform
		CO4	Effectively communicate the ideas/process/solutions in both verbal and written
DATA VISUALIZATION WITH PYTHON	BCS358D	CO1	Develop the simple programs using basics of Python programming construct.
		CO2	Show the plotting and visualization of different graphs and Matplotlib, Plotly, Bokeh and Seaborn.
ANALYSIS & DESIGN OF ALGORITHMS	BCS401	CO1	Apply asymptotic notational method to analyse the performance of the algorithms in terms of time complexity.
		CO2	Demonstrate divide & conquer approaches and decrease & conquer approaches to solve computational problems.
		CO3	Make use of transform & conquer and Input Enhancements method to design solutions for the trees and string related problems.
		CO4	Apply greedy and Dynamic Programming methods to solve typical problems in that design technique
		CO5	Illustrate various classes (P, NP and NP Complete) of problems Solve backtracking, branch & bound and approximation methods problems
ADVANCED JAVA	BCS402	CO1	Identify the need for advanced Java concepts like Collections Framework
		CO2	Demonstrate the fundamental concepts of various String operations.
		CO3	Design and Develop applications based based on Swing and AWT.
		CO4	Develop an application using Servlet and its packages, JSP and cookies
		CO5	Demonstrate the use of JDBC/ODBC to access database and transaction processing
DATABASE MANAGEMENT SYSTEM	BCS403	CO1	Describe the fundamental database concepts, architecture, Data Models ,ER models, Concurrency Control, NoSQL and Big Data.
		CO2	Illustrates the concepts of Relational Algebra and Relational Model.
		CO3	Apply the various SQL statements and Normalization form



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		CO4	Interpret the transaction processing concept.
		CO5	Develop the database applications for the given real world problem.
ANALYSIS & DESIGN OF ALGORITHMS LAB	BCSL404	CO1	Develop programs to solve computational problems using suitable algorithm design strategy.
		CO2	Compare algorithm design strategies by developing equivalent programs and observing running times for analysis (Empirical).
		CO3	Make use of suitable integrated development tools to develop programs
		CO4	Choose appropriate algorithm design techniques to develop solution to the computational and complex problems.
		CO5	Demonstrate and present the development of program, its execution and running time(s) and record the results/inferences
DISCRETE MATHEMATICAL STRUCTURES	BCS405A	CO1	Apply concepts of logical reasoning and mathematical proof techniques in proving theorems and statements
		CO2	Demonstrate the application of discrete structures in different fields of computer science.
		CO3	Apply the basic concepts of relations, functions and partially ordered sets for computer representations.
		CO4	Solve problems involving recurrence relations and generating functions
		CO5	Illustrate the fundamental principles of Algebraic structures with the problems related to computer science & engineering.
UI/UX	BCS456C	CO1	Explain the user experience design requirements.
		CO2	Relate design thinking concepts and mental models to UX design.
		CO3	Illustrate UX design in line with design goals, metrics and targets.
		CO4	Demonstrate different prototyping in relation with software engineering.
		CO5	Explain UX design principles with case examples.
BIOLOGY FOR COMPUTER ENGINEER	BBOC407	CO1	Elucidate the basic biological concepts via relevant industrial applications and case studies.



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		CO2	Evaluate the principles of design and development, for exploring novel bioengineering projects.
		CO3	Corroborate the concepts of biomimetics for specific requirements.
		CO4	Think critically towards exploring innovative biobased solutions for socially relevant problems.
UNIVERSAL HUMAN VALUES COURSE	BUHK408	CO1	To become more aware of themselves, and their surroundings (family, society, nature)
		CO2	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
		CO3	They would have better critical ability. They would also become sensitive to their commitment towards what they have understood
		CO4	They would be able to apply what they have learnt to their own self in different day-to-day
		CO5	To help the students appreciate the essential complementarily between values and skills



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## 2021 SCHEME

Course Name	Course Code	CO. No.	Course Outcomes
TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES	21MAT31	CO1	To Solve Ordinary Differential Equations Using Laplace Transform.
		CO2	Demonstrate Fourier Series To Study The Behaviour Of Periodic Functions And Their Applications In System Communications, Digital Signal Processing And Field Theory.
		CO3	To Use Fourier Transforms To Analyze Problems Involving Continuous-Time Signals And To Apply Ztransform Techniques To Solve Difference Equations
		CO4	To Solve Mathematical Models Represented By Initial Or Boundary Value Problems Involving Partial Differential Equations
		CO5	Determine The Extremals Of Functionals Using Calculus Of Variations And Solve Problems Arising In Dynamics Of Rigid Bodies And Vibrational Analysis.
DATA STRUCTURES & APPLICATIONS	21CS32	CO1	Identify Different Data Structures And Their Applications.
		CO2	Apply Stack And Queues In Solving Problems.
		CO3	Demonstrate Applications Of Linked List.
		CO4	Explore The Applications Of Trees And Graphs To Model And Solve The Real-World Problem.
		CO5	Make Use Of Hashing Techniques And Resolve Collisions During Mapping Of Key Value Pairs
ANALOG & DIGITAL ELECTRONICS	21CS33	CO1	Illustrate The Working Of Analog, Combinational And Sequential Logic Circuits.
		CO2	Implement Boolean Minimization Techniques To Simplify Combinational And Sequential Logic Circuits.
		CO3	Design Data Processing Circuits, Registers And Counters Using Gates And Flip-Flops.
		CO4	Analyze The Results Of Sequential Logic Circuits For The Given Inputs.
COMPUTER ORGANIZATION AND ARCHITECTURE	21CS34	CO1	Illustrate The Basic Functioning Of A Computer System And The Use Of Assembly Language Instructions
		CO2	Illustrate The Working Of I/O Devices, Basic Processing Unit, Memory , Pipelining And Vector Processing
		CO3	Compute Arithmetic Operations Using Fast Adders
		CO4	Design Simple Memory Units, I/O Interfaces, Control Units, Pipelining And Parallel Architecture
OBJECT	21CSL35	CO1	Use Eclipse IDE To Design, Develop, Debug Java



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ORIENTED PROGRAMMING WITH JAVA LABORATORY			Programs.
		CO2	Analyze The Necessity For Object Oriented Programming Paradigm Over Structured Programming And Become Familiar With The Fundamental Concepts In OOP
		CO3	Demonstrate The Ability To Design And Develop Java Programs, Analyze, And Interpret Objectoriented Data And Document Results.
		CO4	Apply The Concepts Of Multiprogramming, Exception/Event Handling, Abstraction To Develop Robust Programs
		CO5	Develop User Friendly Applications Using File I/O And GUI Concepts.
SOCIAL CONNECT AND RESPONSIBILITY	21UH36	CO1	Understand Social Responsibility And Ethics Towards Mankind And Environment
		CO2	Practice Sustainability And Creativity To Have An Impact On The Society.
		CO3	Exhibit Planning And Organizational Skills In A Given Platform
		CO4	Effectively Communicate The Ideas/Process/Solutions In Both Verbal And Written
CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS	21CIP37/47	CO1	Analyse The Basic Structure Of Indian Constitution.
		CO2	Remember Their Fundamental Rights, DPSP's And Fundamental Duties (FD's) Of Our Constitution.
		CO3	Know About Our Union Government, Political Structure & Codes, Procedures.
		CO4	Understand Our State Executive & Elections System Of India.
		CO5	Remember The Amendments And Emergency Provisions, Other Important Provisions Given By The Constitution.
PROGRAMMING IN C++	21CS382	CO1	Summarize The Fundamental Concepts Of Object-Oriented Programming.
		CO2	Describe The Various Functions Used In C++ Language.
		CO3	Explain The Different Types Of Inheritance And Constructor To Solve Simple Problems.
		CO4	Explain Different File I/O Functions In C++.
		CO5	Describe The Various Techniques To Handle Exceptions In C++ Program.
DIP MATHEMATICS	21MATDIP31	CO1	Use Derivatives And Partial Derivatives To Calculate The Rate Of Change Of Multivariate Functions.
		CO2	Apply Concepts Of Complex Numbers And Vector Algebra To Analyse The Problems Arising In A Related Area.
		CO3	Analyse Position, Velocity And Acceleration In Two



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			And Three Dimensions Of Vector-Valued Functions.
		CO4	Learn Techniques Of Integration Including The Evaluation Of Double And Triple Integrals.
		CO5	Identify And Solve First-Order Ordinary Differential Equations.
MATHEMATICAL FOUNDATION FOR COMPUTING	21CS41	CO1	Apply The Concepts Of Logic For Effective Computation And Relating Problems In The Engineering Domain.
		CO2	Analyze The Concepts Of Functions And Relations To Various Fields Of Engineering. Comprehend The Concepts Of Graph Theory For Various Applications Of Computational Sciences.
		CO3	Apply Discrete And Continuous Probability Distributions In Analysing The Probability Models Arising In The Engineering Field.
		CO4	Make Use Of The Correlation And Regression Analysis To Fit A Suitable Mathematical Model For The Statistical Data.
		CO5	Construct Joint Probability Distributions And Demonstrate The Validity Of Testing The Hypothesis.
DESIGN AND ANALYSIS OF ALGORITHM	21CS42	CO1	Analyze The Performance Of The Algorithms, State The Efficiency Using Asymptotic Notations And Analyze Mathematically The Complexity Of The Algorithm. L4 (60%)
		CO2	Apply The Appropriate Algorithmic Design Technique To Solve The Given Problem. L3 (60%)
		CO3	Solve The Various Computational Problems Like Searching, Sorting, Graph, Combinatorial, String-Matching Problems By Using Different Algorithms. L3 (55%)
		CO4	Compare And Analyze The Computational Complexity Of Different Algorithms. L4 (55%)
		CO5	Design And Implement The Various Design Technique To Solve The Given Problem. L5 (60%)
MICROCONTROLLER AND EMBEDDED SYSTEM	21CS43	CO1	Describe The Architecture And Working Principles Of ARM And Embedded Systems. [Level 2]
		CO2	Illustrate The Working Of Different ARM Instruction Set. [Level 3]
		CO3	Interpret The Roles Of Embedded Systems For Real Time Applications [Level3]
		CO4	Identify The Different RTOS And IDE For Embedded Systems.[Level 2]
OPERATING SYSTEM	21CS44	CO1	Describe The Need Of Operating System, Process, Memory Scheduling, Deadlocks And File System Management.





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		CO2	Apply Different Process Scheduling, Deadlock Prevention And Disk Scheduling Algorithms For A Given Problem.
		CO3	Analyze The Concepts Of Memory Management, Implementation Of File System And Process Deadlocks
		CO4	Demonstrate The Secondary Storage Structures And Case Study Of Linux Operating System
BIOLOGY FOR ENGINEERS	21BE45	CO1	Elucidate The Basic Biological Concepts Via Relevant Industrial Applications And Case Studies.
		CO2	Evaluate The Principles Of Design And Development, For Exploring Novel Bioengineering Projects.
		CO3	Corroborate The Concepts Of Biomimetics For Specific Requirements.
		CO4	Think Critically Towards Exploring Innovative Biobased Solutions For Socially Relevant Problems.
PYTHON PROGRAMMING LABORATORY	21CSL46	CO1	Illustrate The Handling Of Python IDLE, Datatypes, Operators, Loops, Conditional Statement And Functions.
		CO2	Interpret The Python Methods To Create, Manipulate Strings, Lists, Tuples And Dictionaries.
		CO3	Demonstrate Pattern Recognition Using Regular Expressions And Reading, Writing, Organizing Files
		CO4	Apply The Concepts Of Object-Oriented Programming Used In Python
		CO5	Analyze The Need Of Scraping Websites, Working With PDF, JSON And Other File Formats.
SAMSKRUTHIKA KANNADA	21KSK47	CO1	Kannada Nadu,Nudi Mattu Samsruthiya Bagge Parichaya
		CO2	Kannada Adalitha Padagala Parichaya.
		CO3	Kannada Vachanagala Parichaya.
		CO4	Kannada Janapada Sahithya.
BALAKE KANNADA	21KBK47	CO1	Kannada Padagala Parichaya
		CO2	Kannada Bhaseyalli Mathanaduvudu ,Oduvudhu, Bareyuvudhu.
		CO3	Kannadadhali Samvahana Nadesuvudhu.
		CO4	Prathi Dina Kannada Padagala Balake
		CO5	Kannadadhali Vyavahisuvadu.
UNIX SHELL PROGRAMMING	21CS482	CO1	Know The Basics Of Unix Concepts And Commands.
		CO2	Evaluate The UNIX File System.
		CO3	Apply Changes In File System
		CO4	Understand Scripts And Programs.
		CO5	Analyze Facility With UNIX System Process
UNIVERSAL HUMAN VALUES	21UH49	CO1	To Become More Aware Of Themselves, And Their Surroundings (Family, Society, Nature)
		CO2	They Would Become More Responsible In Life, And In



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			Handling Problems With Sustainable Solutions, While Keeping Human Relationships And Human Nature In Mind.
		CO3	They Would Have Better Critical Ability. They Would Also Become Sensitive To Their Commitment Towards What They Have Understood
		CO4	They Would Be Able To Apply What They Have Learnt To Their Own Self In Different Day-To-Day Settings In Real Life, At Least A Beginning Would Be Made In This Direction.
ADDITIONAL MATHEMATICS-II	21MATDIP41	CO1	Test For Consistency And Solve The System Of Linear Equations
		CO2	Solve Higher Order Differential Equations
		CO3	Apply Elementary Probability Theory And Solve Related Problems
		CO4	To Interpolate/Extrapolate From The Given Data
		CO5	Apply The Knowledge Of Numerical Methods In Modelling And Solving Engineering Problems
AUTOMATA THEORY AND COMPILER DESIGN	21CS51	CO1	Illustrate The Fundamental Concepts In Automata Theory And Formal Languages.
		CO2	Construct DFA, NFA, E-NFA, RE And Grammar For Different Languages.
		CO3	Design PDA And Turing Machine For Different Language.
		CO4	Illustrate The Various Phases Of Compiler Design.
		CO5	Design Lexical Analyzers, Parsers And Code Generators By Applying The Concepts Of Automata Theory.
COMPUTER NETWORKS	21CS52	CO1	Describe The Basic Needs Of Communication System And Its Protocols.
		CO2	Illustrate The Data Communication Challenges And Its Solution.
		CO3	Illustrate Routing And Congestion Control Algorithms In Network And Transport Layer.
		CO4	Implement And Simulate The Various Network Design Issues To Solve The Given Problem
DATABASE MANAGEMENT SYSTEM	21CS53	CO1	Identify, Analyze And Define Database Objects, Enforce Integrity Constraints On A Database Using RDBMS
		CO2	Use Structured Query Language (SQL) For Database Manipulation And Also Demonstrate The Basic Of Query Evaluation
		CO3	Design And Build Simple Database Systems And Relate The Concept Of Transaction, Concurrency Control And Recovery In Database
		CO4	Develop Application To Interact With Databases,



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			Relational Algebra Expression.
		CO5	Develop Applications Using Tuple And Domain Relation Expression From Queries.
ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	21CS54	CO1	Illustrate The Working Of Artificial Intelligence & Machine Learning Concepts.
		CO2	Demonstrate The Concepts Of Artificial Neural Network .
		CO3	Apply The Statistical Concepts To Solve The Problems Using Supervised Algorithms
		CO4	Apply The Knowledge Of Clustering Algorithms On Various Dataset.
DATABASE MANAGEMENT SYSTEMS LAB WITH MINI PROJECT	21CSL55	CO1	Design An Entity Relationship Diagram And Relational Schema For The Given Problem Specification
		CO2	Create, Update And Query On The Database Using SQL.
		CO3	Populate And Query A Database Using SQL DML/DDL Commands
		CO4	Implement, Analyze And Evaluate The Project Developed For An Application
RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS	21RMI56	CO1	Explain The Concepts Of Engineering Research And Ethics Associated With It.
		CO2	Illustrate The Procedure Of Literature Review, Technical Reading And Citations.
		CO3	Describe The Fundamentals Of Intellectual Property, Patent Laws And Drafting Procedure.
		CO4	Explain The Copyright Laws, Related Rights And Concepts Of Trademarks.
		CO5	Describe The Principles Of Industrial Designs, Design Rights And Geographical Indications Concepts.
ENVIRONMENTAL STUDIES	21CIV57	CO1	Gain Knowledge Of Ecology, Environment, Environmental Policies And Regulations, Clean Energy Sources, Natural Resource Management And Sustainability
		CO2	Understand The Factors Causing Pollution To Water, Soil, Noise And Air And Their Global Environmental Concerns.
ANGULAR JS	21CSL581	CO1	Develop Angular JS Programs Using Basic Features.
		CO2	Develop Web Applications Using Angularjs Modules.
		CO3	Make Use Of Form Validations And Controls For Interactive Applications.
		CO4	Apply The Concepts Of Expressions, Data Bindings And Filters In Developing Angular JS Programs.
		CO5	Make Use Of Modern Tools To Develop Web Applications.
SOFTWARE ENGINEERING	21CS61	CO1	Explain The Activities Involved In Software Engineering And Analyze The Role Of Various Process



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G AND PROJECT MANAGEMEN T			Models.
		CO2	Apply The Basics Of Object-Oriented Concepts And Build A Suitable Class Model Using Modeling Techniques.
		CO3	Analyze The Various Software Testing Methods And To Understand The Importance Of Agile Methodology And Devops Also Interpret The Role Of Project Planning And Quality Management In Software Development
		CO4	Determine The Importance Of Activity Planning And Different Planning Models.
FULLSTACK DEVELOPE M E N T	21CS62	CO1	Describe And Understand The Working Of MVT Based Full Stack Web Development With Django
		CO2	Generate And Designing Of Models And Forms For Rapid Development Of Web Pages.
		CO3	Analyze The Role Of Template Inheritance And Generic Views For Developing Full Stack Web Applications.
		CO4	Apply The Django Framework Libraries To Render Nonhtml Contents Like CSV And PDF
		CO5	Perform JQuery Based AJAX Integration To Django Apps To Build Responsive Full Stack Web Applications,
SOFTWARE TESTING	21IS63	CO1	Explain The Significance Of Software Testing And Quality Assurance In Software Development
		CO2	Apply Different Functional Testing Techniques And Structural Testing Techniques To Write Test Cases On Real World Problems.
		CO3	Analyze The Suitable Testing Model To Derive Test Cases For Any Given Application.
		CO4	Interpret The Different Levels Of Testing For Any Real World Problems
PROFESSIONAL ELECTIVE COURSE:1	21CS641	CO1	To Understand Basics Of Agile Technologies
		CO2	To Understand XP Lifecycle, XP Concepts And Adopting Of XP
		CO3	To Evaluate On Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements And Customer Tests
		CO4	To Become Mastering In Agility
		CO5	To Provide Well Delivered Value From Agile
OPEN ELECTIVE COURSE-1	OEC21XX5 X	CO1	Use The Syntax And Semantics Of Java Programming Language And Basic Concepts Of OOP
		CO2	Apply Appropriate Oops Concepts To Develop Efficient Java Programs
		CO3	Demonstrate The Concepts Of Inheritance, Polymorphism, Interfaces And Packages, Multithreading



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			And Exception Handling To Develop Efficient And Error Free Codes.
		CO4	Design Event Driven GUI And Web Related Applications Which Mimic The Real World Scenarios.
SOFTWARE TESTING LABORATORY	21IS6	CO1	Apply Functional And Structural Testing Techniques To Write Test Cases Of Any Real World Problems
		CO2	Demonstrate The Usage Of Modern Testing Tools To Test Any Mini Project.
MINI PROJECT	MP21ISMP67	CO1	Discover Potential Domain Areas In The Field Of IT
		CO2	Compare And Contrast The Several Existing Solutions For The Problems Identified
		CO3	Demonstrate An Ability To Work In Teams And Elaborate The Feasibility Study Of The Project
		CO4	Formulate And Propose A Plan For Creating A Solution For The Project Plan Identified
		CO5	Present The Findings Of The Study Conducted In The Preferred Domain
INNOVATION /ENTREPRENEURSHIP/SOCIAL INTERNSHIP	INT 21INT68	CO1	Identify The Core Principles And Terminologies Used In [Specific Industry Or Field].
		CO2	Explain The Process And Functions Of [Specific Tasks] In The Context Of Their Internship.
		CO3	Apply Project Management Techniques To Manage Tasks Within The Internship Setting.
		CO4	Analyze The Effectiveness Of A Specific Process Or Strategy Used During The Internship.
		CO5	Evaluate The Outcomes Of A Project And Provide A Critical Assessment Of Its Success And Areas For Improvement.
		CO6	Design A Comprehensive Plan Or Project Proposal That Addresses A Specific Need Or Problem Identified During The Internship.



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## 2018 SCHEME COURSE OUTCOMES

Course Name	Course Code	CO. No.	Course Outcomes
ENGG. MATHEMATICS- III	18MAT31	CO1	Have the knowledge of Laplace Transforms, Fourier series, Fourier transforms, Z-transforms, Calculus of variations and Numerical methods.
		CO2	Solve Engineering problems using Laplace Transforms, Fourier series, Fourier transforms, Numerical methods and Calculus of Variation.
		CO3	Communicate and reflect on applications of Mathematics as tool.
DATA STRUCTURE & APPLICATIONS	18CS32	CO1	Illustrate the working of linear and non-linear data structures.[PO:1]
		CO2	Choose appropriate data structure for solving problems.[PO:1,2,3]
		CO3	Apply basic operations like sorting, searching, insertion, deletion, traversing mechanism etc. on various data structures. [PO:1,2,3]
		CO4	Write programs for applications of data structures. [PO:1,2,3]
ANALOG & DIGITAL ELECTRONICS	18CS33	CO1	Illustrate the working of analog , combinational and sequential logic circuits.
		CO2	Implement Boolean minimization techniques to simplify combinational and sequential logic circuits.
		CO3	Design data processing circuits, registers and counters using gates and flip-flops.
		CO4	Analyze the results of sequential logic circuits for the given inputs.
COMPUTER ORGANIZATION	18CS34	CO1	Illustrate the basic functioning of a computer system and the use of assembly language instructions
		CO2	Illustrate the working of I/O devices, Basic processing unit, Memory and Interrupt handling mechanisms
		CO3	Compute Arithmetic operations using fast adders and floating point units
		CO4	Design simple memory units, I/O interfaces & control units.
SOFTWARE ENGINEERING	18CS35	CO1	Identify and describe software process, types of requirement and software engineering principles used for building software system.
		CO2	Apply object oriented modeling, Design and implementation principles for developing software.
		CO3	Illustrate Project planning, software testing approaches, Software evolution process, Quality assurance and management during development of software.
		CO4	Analyze the various case studies and design a different



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			models for developing a software.
DISCRETE MATHEMATICAL STRUCTURES	18CS36	CO1	Illustrate the fundamental concepts of set theory, reasoning, quantifiers, relations, counting principle, Graphs and Trees.
		CO2	Solve computer application related problems by employing the knowledge of quantifiers, relations, principle of counting, graphs and tree.
		CO3	Apply the different rules of inference, theory of probability, mathematical induction and principle of inclusion / exclusion to solve the problems.
		CO4	Analyze syntax and knowledge gained by logic, functions, relation, graphs, trees and apply them to related areas for deriving the solutions.
ANALOG DIGITAL ELECTRONICS LABORATORY	18CPL37	CO1	Design various analog and digital circuits using required parameters.
		CO2	Implement the circuits using suitable hardware components ,devices and KEIL and Pspice software
		CO3	Compare the results of implemented circuits with simulation output.
		CO4	Record the output of the conducted experiments.
DATA STRUCTURES LABORATORY	18CSL38	CO1	Demonstrate the working of various linear and non-linear data structures.
		CO2	Write the programs using appropriate data structure for solving real world problems.
		CO3	Implement few applications of Data Structures.
COMPLEX ANALYSIS, PROBABILITY & STATISTICAL METHODS	18MAT41	CO1	Have the knowledge of statistical methods complex variables, probability, sampling theory and stochastic process.
		CO2	Compute the solutions using complex variables, statistical methods and probability, sampling theory and stochastic process.
		CO3	Interpret the solutions using complex variables, statistical methods and probability, sampling theory and stochastic process.
DESIGN & ANALYSIS OF ALGORITHMS	18CS42	CO1	Describe the framework for performance analysis of Algorithms and define the limitations of algorithmic power.
		CO2	Develop algorithms using standard algorithm design techniques to solve computational problems.
		CO3	Solve the various computational problems like searching, sorting, graph, combinatorial, string matching problems by using different algorithms.
		CO4	Examine the computational complexity of different algorithms.
		CO5	Apply Backtracking and Branch-and- Bound techniques to solve exponential growth problems.



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OPERATING SYSTEMS	18CS43	CO1	Describe the Need of operating system, Process, memory Scheduling, deadlocks and File System Management.
		CO2	Apply different Process Scheduling, deadlock prevention and disk scheduling Algorithms for a given problem.
		CO3	Illustrate the Concepts of memory management ,implementation of file system and process deadlocks.
		CO4	Demonstrate the secondary storage structures and case study of Linux operating system
MICROCONTROLLER & EMBEDDED SYSTEMS	18CS44	CO1	Describe the architecture and working principles of ARM and embedded systems.
		CO2	Illustrate the working of different ARM Instruction set.
		CO3	Interpret the roles of embedded systems for Real Time Applications
		CO4	Identify the different RTOS , IDE and attribute modules for designing Embedded systems.
OBJECT ORIENTED CONCEPTS	18CS45	CO1	Illustrate the Object oriented programming features.
		CO2	Implement the features of Object Oriented Concepts using c++/java.
		CO3	Apply knowledge of inheritance, Exception Handling and Packaging to build Java Applications.
		CO4	Apply concepts of Multi-Threading and event handling to enhance Java Applications.
		CO5	Develop GUI based Java Applications using Swings.
DATA COMMUNICATION	18CS46	CO1	Identify the networking concepts, protocols associated with wired and wireless networks. Level – 2
		CO2	Apply the different signal conversion methods for the user defined data. Level - 3
		CO3	Experiment with different error detection methods, addressing and sub netting for the sample Data. Level – 4
		CO4	Analyze the performance of the network and different switching techniques. Level - 4
DESIGN & ANALYSIS OF ALGORITHMS LABORATORY	18CSL47	CO1	Write the program for the given specifications.
		CO2	Demonstrate / Simulate the experiments with the given specification
		CO3	Tabulate, Validate the readings and infer the results graphically/mathematically.
		CO4	Interpret the concepts and results both orally and written
MICROCONTROLLER & EMBEDDED SYSTEMS LABORATORY	18CSL48	CO1	Design/Write the program for the given specifications.
		CO2	Conduct / Demonstrate / Simulate the experiments with the given specification.
		CO3	Tabulate, Validate the readings and infer the results graphically/mathematically.





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		CO4	Interpret the concepts and results both orally and written
MANAGEMENT ENTREPRENEURS HIP FOR IT INDUSTRY	18CS51	CO1	Describe the fundamental concepts of management and outline their importance in entrepreneurship.
		CO2	Summarize the role of entrepreneurs in economic development.
		CO3	Preparation of Project and ERP, the use of ERP and institutional support in entrepreneurship.
		CO4	Analyze the Micro and Small Enterprises
COMPUTER NETWORKS AND SECURITY	18CS52	CO1	Describe the protocols in various TCP/IP layers like Application, transport, and network.
		CO2	Illustrate the flow control and congestion control techniques for a real time scenario.
		CO3	Apply network routing and security algorithms for different applications.
		CO4	Analyze the multimedia streaming and content distribution techniques.
DATABASE MANAGEMENT SYSTEM	18CS53	CO1	Identify and describe software process, types of requirement and software engineering principles used for building software system.
		CO2	Apply object oriented modeling, Design and implementation principles for developing software.
		CO3	Illustrate Project planning, software testing approaches, Software evolution process, Quality assurance and management during development of software.
		CO4	Analyze the various case studies and design a different models for developing a software.
AUTOMATA THEORY AND COMPUTABILITY	18CS54	CO1	Describe the core concepts in automata theory and Theory of Computation.
		CO2	Apply different methods of formal languages in solving any given problems
		CO3	Analyze grammars for different formal language classes
		CO4	Design Automata models in terms of deterministic and non-deterministic for a given specification
APPLICATION DEVELOPMENT USING PYTHON	18CS55	CO1	Describe the syntax and semantics of python programming like flow control, data structure, regular expressions, object-oriented programming.
		CO2	Demonstrate the use of built-in functions to navigate the file system.
		CO3	Write python programs using data structures and other constructs in python programming language
		CO4	Evaluate the need for working with various documents like Excel, PDF, Word.
UNIX PROGRAMMING	18CS56	CO1	Describe multiuser UNIX OS, its basic features, Unix files, APIs and process.
		CO2	Interpret UNIX Commands, Shell basics, and shell environments, explain UNIX



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			processes signals and daemon processes, interprocess communication message queues and semaphores.
		CO3	Write programs using shell scripts for implementation UNIX processes, signals and Daemon processes.
		CO4	Analyze network based applications using pipes, message queues, semaphores and shared memory.
COMPUTER NETWORK LABORATORY	18CSL57	CO1	Design/Write the program for the given specifications.
		CO2	Conduct / Demonstrate / Simulate the experiments with the given specification.
		CO3	Tabulate, Validate the readings and infer the results graphically/mathematically.
		CO4	Interpret the concepts and results both orally and written.
DBMS LABORATORY WITH MINI PROJECT	18CSL58	CO1	Design an Entity Relationship diagram and relational schema for the given problem specification
		CO2	Create and maintain tables using SQL
		CO3	Populate and query a database using SQL DML/DDL Commands
		CO4	Design and build a database application using SQL & front end tools
ENVIRONMENTAL STUDIES	18CIV59	CO1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
		CO2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
		CO3	Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components.
		CO4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.
FILE STRUCTURES	18IS61	CO1	Describe the fundamental concepts of file processing, storage structures and record manipulations.
		CO2	Demonstrate different file structure algorithms like hashing, searching, extendible hashing and collision handling.
		CO3	Apply different algorithm for sorting, merging and accessing files from hard disk.
		CO4	Illustrate the implementation of different binary trees.
SOFTWARE TESTING	18IS62	CO1	Illustrate the principles of Validation, verification, Planning and monitoring the process.
		CO2	Analyze the different levels of testing.
		CO3	Design and develop test cases using Black box Testing Techniques and White box Testing Techniques.
		CO4	Apply testing type for the given application.



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WEB TECHNOLOGY AND ITS APPLICATIONS	18CS63	CO1	Illustrate the concept of web elements used to develop web pages.
		CO2	Identify appropriate web elements to prepare static and dynamic Web Pages.
		CO3	Apply the concepts of JavaScript, Ajax, JSON, XML, JQuery to add dynamicity and animations to Web Pages.
		CO4	Develop server-side programs to generate dynamic web pages.
DATA MINING & DATA WAREHOUSING	18CS64X	CO1	Describe data warehousing fundamentals, principles of data mining, association rules, classification and clustering (Level 2). 75%
		CO2	Apply the association rules for mining the patterns, and solve problems using classification and clustering algorithms (Level 3). 65%
		CO3	Analyze data and choose relevant classification or clustering algorithms for respective applications (Level 4). 65%
		CO4	Compare and contrast between OLAP and OLTP, different data models, OLAP server architectures, alternative methods for generating frequent item sets, and comparing classifiers (Level 2). 75%
ADVANCED JAVA	18CS64X	CO1	Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs
		CO2	Interpret Collection framework and Interfaces and String Handling classes
		CO3	Describe String Buffer and the servlets and its API in Java-based web application architecture to develop client-server applications
		CO4	Develop distributed web application using Servlets and JSP
		CO5	Apply the concepts of JDBC, Transaction processing, statement objects and Resultset to perform operations on Database
OPEN ELECTIVE – A INTRODUCTION TO DATA STRUCTURES AND ALGORITHM)	18CS652	CO1	Identify different data structures in C programming language
		CO2	Appraise the use of data structures in problem solving
		CO3	Implement data structures using C programming language.
SOFTWARE TESTING LABORATORY	18IS6	CO1	Write the programs for given problem statement using any programming concepts.
		CO2	Execute the program for given specification.
		CO3	Design and develop test cases and validate the output for given input to verify the test cases
		CO4	Interpret the testing techniques on the program results



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			both orally and written.
FILE STRUCTURES LABORATORY WITH MINI PROJECT	18IS7	CO1	Write the programs for given problem statement using appropriate file structures concepts.
		CO2	Execute the program for given specification.
		CO3	Validate the output for given input.
		CO4	Interpret different file structure concepts and program results both orally and written.
MOBILE APPLICATION DEVELOPMENT	18CSMP68	CO1	Design the program for the given specifications.
		CO2	Simulate the experiments with the given specification.
		CO3	Validate the readings and infer the results graphically/mathematically.
		CO4	Interpret the concepts and results both orally and written.
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	18CS71	CO1	Describe the syntax and semantics Structure of HTML , CSS, java script and PHP.
		CO2	Design web page using HTML, tables, CSS and forms.
		CO3	Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.
		CO4	Apply the principles of object oriented development using PHP
BIG DATA ANALYTICS	18CS72	CO1	Describe the basics concepts of Big Data,HDFS, text and web mining.
		CO2	Illustrate the working of essential hadoop tools , MongoDB and Cassandra databases.
		CO3	Demonstrate the MapReduce programming model to process the big data along with Hadoop tools
		CO4	Analysis of web content, social network and Big data using machine learning algorithms.
SOFTWARE ARCHITECTURE AND DESIGN PATTERNS	18CS731	CO1	Illustrate the working of System Analysis, MVC Architecture, and distributed systems
		CO2	Design patterns with higher performance and lower complexity
		CO3	Implement various design patterns and principles of software architecture
		CO4	Apply the range of different design patterns. Be capable of Comprehending a design presented using this vocabulary.
CRYPTOGRAPHY	18CS744	CO1	Describe the concepts of symmetric key cryptography, public key cryptography, Key distribution and management
		CO2	Interpret the Private Key, Public Key cryptographic and Key exchange algorithms.
		CO3	Use the Cryptographic algorithms, Key exchange protocols and authentication protocols in a distributed environment.



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		CO4	Apply Authentication schemes and E mail security mechanism to provide security for the Internet.
OPEN ELECTIVE – B	18CS75X	CO1	Describe the syntax and semantics of python programming.
		CO2	Apply the concepts of Object-Oriented Programming using Python.
		CO3	Write python programs using data structures and other constructs in python programming Language.
		CO4	Analyze and apply concepts of Network Programming, Web Services and Databases using Python APIs.
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY	18CSL76	CO1	Design the program for the given specifications.
		CO2	Simulate the experiments with the given specification.
		CO3	Validate the readings and infer the results graphically/mathematically.
		CO4	Interpret the concepts and results both orally and written.
PROJECT WORK PHASE – 1	18CSP77	CO1	Select the Domain and Project title based on the interest of the student and guide
		CO2	Evaluate and Analyse the Various Existing System on the domain/Project area where they are working.
		CO3	Compare and contrast the proposed system to Existing system for the Functional and Non functional Requirements
		CO4	Usage of Modern tools and deriving of Hypothesis and evaluating the same for the start of design
		CO5	Design the system architecture(Low level design and High level design) Using UML notations to Demonstate the Project workingness
INTERNET OF THINGS AND APPLICATIONS	18CS81	CO1	Describe the impact and challenges posed by IoT networks leading to new architectural models.
		CO2	Interpret the deployment of smart objects and the technologies to connect them to network.
		CO3	Compare and contrast the role of IoT protocols for efficient network communication.
		CO4	Apply wireless technologies used for communication for sensing real world entities and identify the applications of IoT in Industry.
STORAGE AREA NETWORKS/	18CS822	CO1	Identify key challenges in managing information and analyze different storage networking technologies and virtualization
		CO2	Explain components and the implementation of NAS
		CO3	Describe CAS architecture and types of archives and forms of virtualization
		CO4	Illustrate the storage infrastructure and management activities
PROJECT WORK	18CSP83	CO1	Demonstrate and Evaluate the Design Phase according



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PHASE-2			to Software and System Requirements Specifications
		CO2	Design overall Architecture and also designs the various Algorithms w.r.t their area of Interest(IOT,Cyber security,AI/ML,Data Science and Analytics)
		CO3	Develop and Implement the algorithms so that to make it to an executable component
		CO4	Examine and Evaluate the performance of the system using Modern tool use(Eclipse,Visual studio,Junit,Anaconda,Google collabs)
		CO5	Test or verify and Validate the project for its actual output against SRS(To carry testing such as FunctionalTesting,System testing,Acceptance testing,Integration Testing)
TECHNICAL SEMINAR	18CSS84	CO1	Select recent advances in a specific technical field by performing a comprehensive literature survey.
		CO2	Compare the different solution methods, various software tools and methods for the identified problem.
		CO3	Discuss the advantages and disadvantages of approach, along with possible future directions.
		CO4	Communicate technical content effectively through written and oral presentations.
INTERNSHIP/PROFESSIONAL PRACTICE	18CSI85	CO1	Identify the core principles and terminologies used in [specific industry or field].
		CO2	Explain the process and functions of [specific tasks] in the context of their internship.
		CO3	Apply project management techniques to manage tasks within the internship setting.
		CO4	Analyze the effectiveness of a specific process or strategy used during the internship.
		CO5	Evaluate the outcomes of a project and provide a critical assessment of its success and areas for improvement.