

M.S. Ramaiah University of Applied Sciences

New BEL Road, MSR Nagar, Bangalore – 560054



**RAMAIAH
UNIVERSITY**
OF APPLIED SCIENCES

PO, PSO, PEO & CO

Programme: B. Tech. in Computer Science and Engineering

Programme Code: 002

Programme Outcome (PO)

Programme Specific Outcome (PSO)

Program Educational Objectives (PEO)

Course Outcomes (CO)

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Faculty of Engineering and Technology
M.S. Ramaiah University of Applied Sciences
Bangalore-560058

Registrar

M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

Approved in 23rd ACM (Resolution 23.05) held on 15th July 2021

Faculty of Engineering and Technology (FET)

Programme Name: B. Tech. (Computer Science and Engineering)

Programme Outcomes (POs)

B. Tech. graduates will be able to:

- PO-1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
- PO-2. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
- PO-3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
- PO-4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
- PO-5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
- PO-6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
- PO-7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
- PO-8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
- PO-9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
- PO-10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
- PO-11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
- PO-12. Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

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Programme Specific Outcomes (PSOs)

At the end of the B. Tech. (Computer Science and Engineering) Programme, the graduate will be able to:

- PSO-1. Apply principles and best practices in design of efficient algorithms and correct programs; build reliable, secure and robust software, making use of knowledge of computer architecture, systems software, networking, Web technologies distributed computing
- PSO-2. Use knowledge gained in both breadth courses in science and engineering and depth courses in mathematics and computing, solving problems of relevance to society, industry and R&D in an innovative manner
- PSO-3. Engage in lifelong learning by applying knowledge of fields of computer science and refining it and evangelizing applications and technologies to all interested communities

Program Educational Objectives (PEOs)

The objectives of the B. Tech. (Computer Science and Engineering) Programme are to:

- PEO-1. Provide students with a strong foundation in mathematics and computing along with breadth and foundational requirement in computing, science, engineering and humanities to enable them to devise and deliver efficient and safe solutions to challenging problems in Computer Science and inter-disciplinary areas
- PEO-2. Impart analytic and cognitive skills required to develop innovative solutions for R&D, to build creative, dependable and safe products for Industry based on dynamic societal requirements motivated and nurtured by sound theoretical and practical knowledge of time tested and long lasting principles of computer science, current tools and technologies
- PEO-3. Develop managerial and entrepreneurial skills inculcating strong human values along with social, interpersonal and leadership skills required for professional success in evolving global professional environments

Course Outcomes (COs)

Course Title & Code: Engineering Mathematics - 1 (MTB101A)

After the successful completion of this course, the student will be able to:

- CO-1. State and discuss basic concepts related to single, two variable calculus and matrix algebra
- CO-2. Perform basic operations of matrix algebra and apply them to solve systems of linear equations
- CO-3. Solve simple mathematical problems associated with linear algebra, single and two variable calculus
- CO-4. Demonstrate competence with the basic ideas of linear systems, independence, bases and dimension, linear transformations, eigenvalues, eigenvectors and diagonalization
- CO-5. Solve complex real-world problems associated with linear algebra, single and two variable calculus



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Course Outcomes (COs)

Course Title & Code: Engineering Physics and Laboratory (PYB102A)

After the successful completion of this course, the student will be able to:

- CO-1. State, explain the concepts of mechanics, electrical conductivity, quantum mechanics, crystal structure and material science, laser and fiber optics
- CO-2. Derive standard relationships in mechanics, electrical conductivity, quantum mechanics, crystal structure and material science, laser & fiber optics, and interpret them
- CO-3. Discuss the applications of mechanics, electrical conductivity, quantum mechanics, crystal structure and material science, laser and fiber optics
- CO-4. Solve problems in mechanics, electrical conductivity, quantum mechanics, crystal structure, material science, laser and fiber optics
- CO-5. Plan the experimental set-up, conduct experiments, calculate and plot the graphs to obtain the results and write a laboratory report as per the Prescribed format.

Course Outcomes (COs)

Course Title & Code: Engineering Mechanics (CEF101A)

After the successful completion of this course, the student will be able to:

- CO-1. State and describe the laws of Statics, Friction and Dynamics and their contexts of application.
- CO-2. Interpret standard mathematical relationships and apply for solving simple static and dynamic problems in engineering mechanics
- CO-3. Calculate moment of inertia, determine centroid, centre of gravity for the structural members
- CO-4. Apply the laws of statics and dynamics for the equilibrium analysis of rigid bodies with and without friction
- CO-5. Apply energy methods in analyzing of static and dynamic aspects of engineering structures made of rigid bodies

Course Outcomes (COs)

Course Title & Code: Elements of Electronics Engineering and Laboratory (ECF102A)

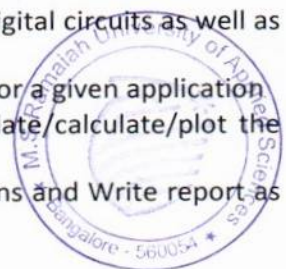
After the successful completion of this course, the student will be able to:

- CO-1. Explain working principles of PN junction diode, Zener diode, transistors, amplifier configurations, Op-Amps, power supply, logic gates and electronic displays
- CO-2. Derive mathematical relationships for electronic devices and circuits
- CO-3. Solve simple numerical and design problems related to analog / digital circuits as well as devices
- CO-4. Design and analyse operation of standard analog / digital circuits for a given application
- CO-5. Conduct experiments as per the standard procedures and tabulate/calculate/plot the measured values
- CO-6. Interpret and compare with standard results, and draw conclusions and Write report as per the prescribed format

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Course Outcomes (COs)

Course Title & Code: Engineering Drawing (MEF103A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the conventions used in projections of geometric entities and interpret the same
- CO-2. Draw orthographic projections for the geometric entities in specified positions
- CO-3. Develop lateral surfaces of un-sectioned and sectioned regular solids
- CO-4. Develop orthographic projections for given applications
- CO-5. Draw isometric projections for the solids and their combinations
- CO-6. Demonstrate competency in using CAD tool for drawing projections of geometric entities

Course Outcomes (COs)

Course Title & Code: Constitution, Human Rights and Law (LAN101A)

After the successful completion of this course, the student will be able to:

- CO-1. Explain the key principles of the Indian Constitution
- CO-2. Explain Indian legal system and judicial structure that govern the citizens
- CO-3. Discuss UN Declaration of Human Rights
- CO-4. Discuss the scope and application of Human Rights Principles and Law
- CO-5. Suggest strategies for protection of human rights and resolving legal issues in compliance with applicable laws

Course Outcomes (COs)

Course Title & Code: Engineering Mathematics - 2 (MTB102A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the fundamentals of ordinary differential equations and Laplace transform
- CO-2. Solve standard forms of ordinary differential equations
- CO-3. Solve simple problems in ordinary differential equations and Laplace transform
- CO-4. Model real world problems using ordinary differential equations and solve complex problems associated with ordinary differential equations using Laplace transform
- CO-5. Apply Laplace transform in solving complex real world engineering problems

Course Outcomes (COs)

Course Title & Code: Engineering Chemistry and Laboratory (CYB104A)

After the successful completion of this course, the student will be able to:

- CO-1. Explain the basic concepts of electrochemistry, conversion of chemical energy into electrical energy, theory of corrosion and principles of metal finishing
- CO-2. Differentiate renewable - nonrenewable fuels, primary - secondary electrodes & primary



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- secondary batteries, batteries - fuel cells, electroplating – electroless plating, thermosetting – thermoplastic polymers and dry corrosion - wet corrosion
- CO-3. Discuss the reaction chemistry and stoichiometry of combustion of fuels, remedial measures to control oxides of nitrogen, sulphur and carbon, polymerization – methods, mechanism, preparation, properties and applications of some polymers, concepts of nano science and nanotechnology
- CO-4. Identify the types of corrosion and methods to prevent corrosion, suitable polymers and nanocomposite materials for engineering applications
- CO-5. Derive kinetic rate equations for various chemical systems and equation for electromotive force
- CO-6. Analyze the suitability of polymers & composites for various applications and solve problems related to storage devices, chemical kinetics, electro chemistry, corrosion and metal finishing
- CO-7. Plan the experimental set up, conduct experiments, calculate and plot the graphs to obtain results, and write a laboratory report as per the prescribed format

Course Outcomes (COs)

Course Title & Code: Elements of Mechanical Engineering and Workshop Practice (MEF104A)

After the successful completion of this course, the student will be able to:

- CO-1. Demonstrate the understanding on Classification of energy sources, energy conversion systems, mechanical power transmission systems, machine tools and processes
- CO-2. Describe various energy conversion systems, mechanical power transmission systems and machine tools
- CO-3. Explain the working principle of refrigeration systems, biomass conversion technologies and machining operations
- CO-4. Solve numerical problems on IC engines and mechanical power transmission systems
- CO-5. Apply principles of energy conversion systems, power transmission systems, machining processes and mechanical joints to practical applications

Course Outcomes (COs)

Course Title & Code: Elements of Electrical Engineering and Laboratory (EEF105A)

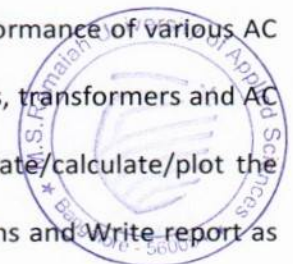
After the successful completion of this course, the student will be able to:

- CO-1. State and explain various laws of electric circuits, magnetic circuits and their significance, phasor diagrams for electrical elements
- CO-2. Explain construction, principle of operation, working and characteristics of DC machines, transformers, AC rotating machines and their applications
- CO-3. Derive equations for electrical circuits, magnetic circuits and performance of various AC and DC machines
- CO-4. Solve problems on electric circuits, magnetic circuits, DC machines, transformers and AC rotating machines
- CO-5. Conduct experiments as per the standard procedures and tabulate/calculate/plot the measured values
- CO-6. Interpret and compare with standard results, and draw conclusions and write report as per the prescribed format

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Course Outcomes (COs)

Course Title & Code: Elements of Computer Science and Engineering and Laboratory (CSF106A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the elements and methodology of Computer Science and Engineering
- CO-2. Explain the basic principles and techniques of algorithms and programming
- CO-3. Select appropriate approach to solve a computational problem
- CO-4. Design an algorithmic solution and draw a flow chart of the solution
- CO-5. Develop computer programs for moderately complex problems
- CO-6. Test and validate developed computer programs

Course Outcomes (COs)

Course Title & Code: Professional Communication (TSN101A)

After the successful completion of this course, the student will be able to:

- CO-1. Apply the concepts of grammar for communication
- CO-2. Compose precise paragraphs
- CO-3. Demonstrate professional etiquette
- CO-4. Demonstrate appropriate verbal and non-verbal communication in the given context
- CO-5. Develop professional written document

Course Outcomes (COs)

Course Title & Code: Engineering Mathematics – 3 (MTF201A)

After the successful completion of this course, the student will be able to:

- CO-1. State and explain the important theorems in Fourier series, transforms and vector integral calculus
- CO-2. Solve simple problems in Fourier series, transforms and vector calculus
- CO-3. Apply Fourier series, transforms and vector calculus in solving complex real world engineering problems
- CO-4. Implement the programs to solve system of linear equations and non-linear equations of single variable using MATLAB
- CO-5. Apply interpolation and numerical integration method in analyzing some real world problems

Course Outcomes (COs)

Course Title & Code: Discrete Mathematics (CSC201A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the concepts and theories of sets, logic, integer arithmetic and algebraic




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- structures Classify and describe types of digital circuits
- CO-2. Explain the principles and applications of set theory, logic, integer arithmetic and abstract algebra
 - CO-3. Apply set theory, logic, integer arithmetic and abstract algebra to solve a given problem
 - CO-4. Develop models of computing systems using logical and algebraic structures for given application
 - CO-5. Analyze the properties and behavior of algorithms, programs and computing systems using logical and algebraic constructs

Course Outcomes (COs)

Course Title & Code: Data Structures Foundation (CSD201A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe Linear and Non- Linear data structures such as Stacks, Queues, Linked Lists and Trees
- CO-2. Explain the approaches used to implement the data structures
- CO-3. Discuss the working of standard data access and manipulation algorithms
- CO-4. Implement Stacks, Queues, Linked Lists and Trees
- CO-5. Recommend a suitable data structure and algorithm for modeling a given scenario
- CO-6. Develop computer programs using data structures to solve moderately complex problems

Course Outcomes (COs)

Course Title & Code: Logic Design (CSD202A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the elements of switching and digital design
- CO-2. Explain the principles and techniques of sequential and combinational logic circuits
- CO-3. Apply principles of sequential and combinational logic to design digital circuits
- CO-4. Analyze and optimize digital logic circuits
- CO-5. Design the digital components of a computer using digital logic circuits
- CO-6. Test and validate digital logic circuits

Course Outcomes (COs)

Course Title & Code: Microprocessors and Architecture (CSD203A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the architecture of CPU, memory and I/O subsystems
- CO-2. Explain the concepts and working of computer architectural subsystems
- CO-3. Apply concepts of architecture to design simple architectural components
- CO-4. Analyze, test and validate simple processor design
- CO-5. Design the main functional units of architectural subsystems
- CO-6. Select appropriate architectural features for a given application



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Course Outcomes (COs)

Course Title & Code: Innovation and Entrepreneurship (BAU201A)

After the successful completion of this course, the student will be able to:

- CO-1. Explain the concepts and process of Innovation as well as entrepreneurship
- CO-2. Construct and apply the idea generation techniques
- CO-3. Discuss the opportunities for launching of new venture and various entry strategies
- CO-4. Examine innovative ideas for the creation and management of entrepreneurship
- CO-5. Formulate and present a viable business plan to the investors' appraisal

Course Outcomes (COs)

Course Title & Code: Python and Data Structures Laboratory (CSD204A)

After the successful completion of this course, the student will be able to:

- CO-1. Identify fundamental data structures and algorithms to solve a given problem
- CO-2. Illustrate the working of different data structures
- CO-3. Develop algorithms and programs to solve a given problem using appropriate data structures
- CO-4. Design and develop solution for efficient sorting and searching operations
- CO-5. Evaluate the empirical performance of implemented data structures and algorithms
- CO-6. Document work done and prepare a laboratory report

Course Outcomes (COs)

Course Title & Code: Microprocessors Laboratory (SD205A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the elements of assembly language programming
- CO-2. Discuss the various tools and techniques used for assembly language programming
- CO-3. Apply assembly language constructs to optimize C programs
- CO-4. Synthesize programs using inline assembly statements in C
- CO-5. Analyze, test and validate developed assembly programs
- CO-6. Document work done and prepare a laboratory report

Course Outcomes (COs)

Course Title & Code: Additional Mathematics - 1

After the successful completion of this course, the student will be able to:

- CO-1. State and explain the important theorems and solve simple mathematical problems in one variable calculus and vector algebra
- CO-2. State theorems and solve simple problems in two variable calculus



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- CO-3. Solve complex real world problems associated with one and two real analysis
- CO-4. Illustrate fundamentals of MATLAB programming and write simple programs
- CO-5. Solve complex mathematical problems associated with linear algebra and compare the results with that of solutions obtained using MATLAB

Course Outcomes (COs)

Course Title & Code: Engineering Mathematics – 4 (MTF202A)

After the successful completion of this course, the student will be able to:

- CO-1. Define and explain the concepts of correlation, regression, random variables, probability distribution, partial differential equations and complex analysis
- CO-2. State theorems and solve simple problems in partial differential equations, complex analysis, probability, probability distributions
- CO-3. Apply numerical methods to solve ordinary and partial differential equations using MATLAB
- CO-4. Solve complex engineering problems associated with numerical methods using MATLAB
- CO-5. Analyze real world problems associated with probability, probability distributions, partial differential equations and complex analysis
- CO-6. Construct the Bar chart, pie chart, Histogram, Box-plot and fitting of curves by using MATLAB

Course Outcomes (COs)

Course Title & Code: Software Development Fundamentals (CSC203A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the concepts of requirements analysis, architectural design, program design, testing, and maintenance of software
- CO-2. Explain the principles of software development and maintenance Solve simple problems on logic design and function minimization
- CO-3. Apply the principles of software development to engineer software
- CO-4. Analyze requirements and suggest a design strategy for software development
- CO-5. Design, develop and test software for a given set of requirements
- CO-6. Evaluate software implementations for conformance with requirements adopting quality assurance practices

Course Outcomes (COs)

Course Title & Code: Programming Paradigms (CSD207A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe and distinguish the concepts and features of various programming paradigms
- CO-2. Discuss the features of functional, object oriented and event driven programming paradigms
- CO-3. Apply concepts of functional, object oriented and event driven programming
- CO-4. Analyze the usefulness of a programming paradigms based on ease of expression and



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- scale of development effort
- CO-5. Design software applications using functional, object oriented and event driven approaches
 - CO-6. Synthesize software applications using functional, object oriented and event driven approaches

Course Outcomes (COs)

Course Title & Code: Design and Analysis of Algorithms (CSD206A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the concepts of design of algorithms
- CO-2. Explain the principles of analysis of algorithms
- CO-3. Choose appropriate techniques for design and analysis of algorithms for a given problem
- CO-4. Analyze the worst case and average case complexity of a given algorithm
- CO-5. Design efficient algorithms for a given problem
- CO-6. Compare algorithms based on appropriately chosen measures of complexity

Course Outcomes (COs)

Course Title & Code: Advanced Data Structures (CSC202A)

After the successful completion of this course, the student will be able to:

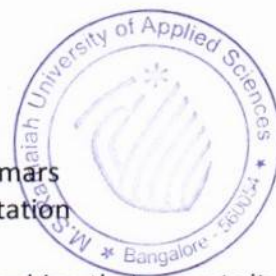
- CO-1. Use the control structures of language C along with the data types
- CO-2. Explain the approaches used to implement data structures in C including the feature of dynamic memory allocation Solve simple problems on logic design and function minimization
- CO-3. Implement various sort algorithms using language C highlighting data structure representation
- CO-4. Implement various search algorithms using language C highlighting data structure representation
- CO-5. Implement text processing algorithms in language C highlighting data structures
- CO-6. Develop computer programs using language C with the right choice of control structures and various features of the language

Course Outcomes (COs)

Course Title & Code: Formal Languages and Automata Theory (CSL201A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe formal languages, automata and models of computation
- CO-2. Explain formal relationships among machines, languages and grammars
- CO-3. Analyze a given language for arriving at a suitable model of computation
- CO-4. Apply automata theory to prove or disprove languages
- CO-5. Design a grammar generating a given language and a computing machine that accepts it



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Course Outcomes (COs)

Course Title & Code: Environmental Studies (BTN101A)

After the successful completion of this course, the student will be able to:

- CO-1. Illustrate the multidisciplinary nature of environmental studies and recognize the need for public awareness
- CO-2. Explain the various natural resources and their associated problems, ecosystem, and environmental pollution
- CO-3. Analyze the concept of ecosystem and classify various types
- CO-4. Compare biodiversity at local, national and global levels
- CO-5. Discuss various social issues pertaining to environment including sustainable development and energy issues

Course Outcomes (COs)

Course Title & Code: Software Development Laboratory (CSL202A)

After the successful completion of this course, the student will be able to:

- CO-1. Relate software engineering methods to the respective phases of software development, building and testing
- CO-2. Explain the process and methodology of creating architecture and refinement to program design based on software requirements
- CO-3. Use Java, C or any programming language to implement the program design following recommended coding guidelines, best practices and build conventions
- CO-4. Analyze requirements and program design and create a test case specification
- CO-5. Design and implement test cases based on test specifications
- CO-6. Create a report documenting the software development activities

Course Outcomes (COs)

Course Title & Code: Programming Paradigms Laboratory (CSD208A)

After the successful completion of this course, the student will be able to:

- CO-1. Relate the concepts of programming paradigm with the constructs of the programming language
- CO-2. Express the model of an application as a program in functional and object-oriented programming languages
- CO-3. Apply event handling and exception handling techniques in programs
- CO-4. Analyze a given application and suggest programming approach and language based on ease of expression and scale of development
- CO-5. Evaluate the usefulness of a programming approach and language for a given application requirement
- CO-6. Document work done and prepared a laboratory report



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Course Outcomes (COs)

Course Title & Code: Additional Mathematics - 2

After the successful completion of this course, the student will be able to:

- CO-1. Describe the fundamentals of ordinary differential equations State theorems and solve simple problems in two variable calculus
- CO-2. Solve standard forms of ordinary differential equations Illustrate fundamentals of Linear algebra
- CO-3. Model real world problems using ordinary differential equations and solve complex problems associated with ordinary differential equations
- CO-4. Apply numerical methods to solve nonlinear equations in one variable, system of linear equations, interpolation and numerical quadrature, and implement the same using MATLAB
- CO-5. Solve complex problems associated with nonlinear equations and linear systems, interpolation and numerical integration using MATLAB

Course Outcomes (COs)

Course Title & Code: Data Mining (CSC302A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the conceptual framework of classification and clustering
- CO-2. Explain the principles of supervised and unsupervised learning algorithms, training and test data
- CO-3. Apply machine learning techniques to solve problems of practical importance
- CO-4. Analyse the given data using classification and clustering algorithms
- CO-5. Synthesise and solve data mining problems of practical importance using theoretical analysis and software tools

Course Outcomes (COs)

Course Title & Code: Probability and Statistics (MTE301A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the basic concepts and techniques of Probability and Statistics.
- CO-2. Explain the principles and applications of basic probability models and statistical techniques
- CO-3. Develop probabilistic and statistical models for a given application
- CO-4. Solve and analyse probabilistic and statistical models
- CO-5. Apply probability models and statistical techniques to solve a complex problem



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Course Outcomes (COs)

Course Title & Code: Database Systems (CSC302A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the concepts, design and applications of database systems
- CO-2. Explain the principles of data modelling, querying, storage, transactions and optimization of database systems
- CO-3. Analyse the schema and use appropriate normalization techniques for relational databases
- CO-4. Develop queries using query languages for a given database system
- CO-5. Apply principles of database systems to model data and create queries
- CO-6. Design and implement an efficient database system and interface it with a given application

Course Outcomes (COs)

Course Title & Code: Computer Networks (CSD301A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the protocols that operate in the TCP/IP stack and Wireless networks
- CO-2. Explain the typical applications of computer networks along with the protocols and security considerations
- CO-3. Choose appropriate network protocols for given applications
- CO-4. Compare and analyze different wired and wireless network protocols for given application requirements
- CO-5. Design different types of servers using appropriate transport layer protocols based on application requirements
- CO-6. Synthesize client-server based computer networks using the sockets API

Course Outcomes (COs)

Course Title & Code: Operating Systems (CSC304A)

After the successful completion of this course, the student will be able to:

- CO-1. Explain operating system and its services
- CO-2. Describe concepts associated with process management, memory management, Inter process communication, input/output devices and file systems
- CO-3. Apply the concepts and principles of operating systems to design operating system services for applications
- CO-4. Analyse and synthesise operating system services for applications
- CO-5. Evaluate the performance of operating system services for applications
- CO-6. Design and validate operating system services for applications

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Course Outcomes (COs)

Course Title & Code: Compilers (CSC301A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the concepts, principles of compilers and their components
- CO-2. Explain the working of compilers and their components
- CO-3. Choose an appropriate parsing algorithm for a programming language based on the type of the grammar used for the language
- CO-4. Design compilers applying the concepts and principles of compiler construction
- CO-5. Identify problems and apply solutions at different stages of compiler
- CO-6. Synthesize, test and validate a compiler for a simple language

Course Outcomes (COs)

Course Title & Code: Database Systems Laboratory (CSL302A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the components of database systems
- CO-2. Explain the principles of database design and implementation
- CO-3. Design a database system for a given application
- CO-4. Implement a database using DBMS and interface it with an application
- CO-5. Test and validate the developed database system
- CO-6. Create a laboratory report documenting the work

Course Outcomes (COs)

Course Title & Code: Computer Networks Laboratory (CSL301A)

After the successful completion of this course, the student will be able to:

- CO-1. Relate the algorithms used by DLL and Network layers to their use in higher layer protocols
- CO-2. Express client-server applications as a set of appropriate function calls, as well as algorithms and/or flowcharts
- CO-3. Apply the Linux sockets API in the development of client-server-based computer networks
- CO-4. Choose between different types of servers and appropriate transport layer protocols
- CO-5. Design and implement applications using appropriate algorithms at PHY, DLL and Network Layers along with client-server interactions and create a laboratory report documenting the complete effort.

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Course Outcomes (COs)

Course Title & Code: Operating Systems Laboratory (CSL303A)

After the successful completion of this course, the student will be able to:

- CO-1. Explain operating system and its services
- CO-2. Describe concepts associated with process management, memory management, Inter process communication, input/output devices and file systems
- CO-3. Apply the concepts and principles of operating systems to design operating system services for applications
- CO-4. Analyse and synthesise operating system services for applications
- CO-5. Simulate and validate operating system services for applications
- CO-6. Create a technical report documenting the laboratory work

Course Outcomes (COs)

Course Title & Code: Graph Theory and Optimization (CSC305A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the concepts, theories and techniques of graph theory and discrete optimization
- CO-2. Explain the principles of graph theory, discrete optimization and their applications in Computer Science and Engineering
- CO-3. Identify and apply appropriate approach from graph theory and discrete optimisation to formulate a given problem
- CO-4. Design graph theory and discrete optimisation based algorithms to solve problems in Computer Science and Engineering
- CO-5. Synthesize efficient algorithms for problems in Computer Science and Engineering using graph structures and discrete optimisation methods
- CO-6. Evaluate the utility of discrete optimisation and graph structures for modelling and analysis of computing systems

Course Outcomes (COs)

Course Title & Code: Information Security and Protection (CSC306A)

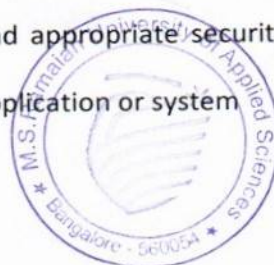
After the successful completion of this course, the student will be able to:

- CO-1. Describe elements and components of information security and protection
- CO-2. Describe security attacks and defense mechanisms
- CO-3. Explain the requirements, principles and models of security policies
- CO-4. Analyze the security properties of a given model
- CO-5. Analyze a given scenario, application or system and recommend appropriate security policies and mechanisms
- CO-6. Develop security policies and mechanisms for a given scenario, application or system

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Course Outcomes (COs)

Course Title & Code: Web Architecture and Application Development (CSC307A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the evolution of Web technologies, related software architectural patterns and frameworks
- CO-2. Explain in detail the layers, components and mechanisms related to Web applications
- CO-3. Describe the different software architectures and its applicable domains
- CO-4. Apply knowledge of Web technologies, patterns and frameworks to create efficient applications for given scenarios
- CO-5. Design simple, efficient, scalable web applications using appropriate patterns, technologies, languages and frameworks
- CO-6. Analyze the efficiency, ease of use and scalability of frameworks for a given scenario

Course Outcomes (COs)

Course Title & Code: Principles of Artificial Intelligence (AID201A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the concepts of artificial intelligence and intelligent agents
- CO-2. Explain the principles of knowledge representation, search strategies, learning, reasoning and planning
- CO-3. Apply the principles of knowledge representation, search strategies, learning, reasoning and planning to design intelligent agents
- CO-4. Analyze a scenario and identify strategies for knowledge representation, search, learning, reasoning and planning
- CO-5. Synthesize an intelligent agent for a given scenario
- CO-6. Evaluate the performance of an intelligent agent based on appropriate measures of performance

Course Outcomes (COs)

Course Title & Code: Computer Graphics (CSC308A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the concepts of computer graphics and graphics pipeline
- CO-2. Explain aspects of modelling, transformation, rendering and the graphics pipeline
- CO-3. Apply algorithms and techniques for modelling, transformation and rendering of objects and scenes
- CO-4. Solve simple mathematical problems associated with modelling, transformation and rendering techniques
- CO-5. Analyze computer scenes for their visual realism
- CO-6. Create computer graphics using graphics library



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Course Outcomes (COs)

Course Title & Code: Seminar (CSS301A)

After the successful completion of this course, the student will be able to:

- CO-1. Demonstrate the understanding of Selection of relevant Topics for Presentations
- CO-2. Get exposed to the Collection of Material, Reading and Comprehension
- CO-3. Learn to make a Report in a given format and Prepare Presentation on the Report
- CO-4. Get into Facing an Audience while presenting their Work and managing a Q&A Session

Course Outcomes (COs)

Course Title & Code: Artificial Intelligence Laboratory (AID202A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the process of modelling, design and synthesis of artificial intelligence applications
- CO-2. Explain the principles of artificial intelligence and intelligent agents
- CO-3. Apply the principles of knowledge representation, search strategies, learning, reasoning and planning to design intelligent agents
- CO-4. Analyze a scenario and identify methods for knowledge representation, search, learning, reasoning and planning
- CO-5. Synthesize an intelligent agent for a given scenario
- CO-6. Evaluate the performance of an intelligent agent based on appropriate measures of performance

Course Outcomes (COs)

Course Title & Code: Web Architecture and Application Development Laboratory (CSL304A)

After the successful completion of this course, the student will be able to:

- CO-1. Relate the patterns and generic web technologies with frameworks, libraries and implementations provided in Java programming language
- CO-2. Translate architectural design to an object oriented design in UML
- CO-3. Apply Java Web technologies to design and implement a Web application
- CO-4. Analyze the design and scale of a Web application for appropriate Web frameworks and technology implementations
- CO-5. Implement Web applications using Java Web frame works and technology
- CO-6. Evaluate the appropriateness of Web technology and frameworks for a given application scenario

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Course Outcomes (COs)

Course Title & Code: Project Work-1 (CSP401A)

After the successful completion of this course, the student will be able to:

- CO-1. Recognise the need for developing a new or improving an existing engineering product/system through an organised survey of literature and requirement analysis
- CO-2. Define engineering design specifications based on the software requirements specification
- CO-3. Design, model, synthesise, analyse the solution to meet the design specifications
- CO-4. Evaluate the performance of the modelled system and justify its performance
- CO-5. Demonstrate the system working in a virtual environment and make a presentation
- CO-6. Write a project report

Course Outcomes (COs)

Course Title & Code: Internship (CSI401A)

After the successful completion of this course, the student will be able to:

- CO-1. Understand the Process Stock of the Industry
- CO-2. Gain experience of the Process Stock by working on an ongoing Project in the Industry
- CO-3. Learn to manifest the work done in the form of a Report in a given format.
- CO-4. Get experienced on Presenting the Work Done and Facing an Audience while presenting their Work.

Course Outcomes (COs)

Course Title & Code: Project Work-2 (CSP402A)

After the successful completion of this course, the student will be able to:

- CO-1. Recognise the need for developing a new or improving an existing engineering product/system through an organised survey of literature and requirement analysis
- CO-2. Define engineering design specifications based on the software requirements specification
- CO-3. Design, model, synthesise, analyse the solution to meet the design specifications
- CO-4. Evaluate the performance of the modelled system and justify its performance
- CO-5. Demonstrate the system working in a virtual environment and make a presentation
- CO-6. Write a project report



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Course Outcomes (COs)

Course Title & Code: Software Architecture (CSE301A)

After the successful completion of this course, the student will be able to:

- CO-1. Explain the concept of software architecture and design patterns
- CO-2. Describe the principle behind software patterns and application of fundamental patterns
- CO-3. Summarize the need for software architecture and principles of classical architectural styles
- CO-4. Outline the major approaches to integrate patterns into software design
- CO-5. Apply software design patterns for various practical scenarios

Course Outcomes (COs)

Course Title & Code: Principles and Practices of Software Testing (CSE405A)

After the successful completion of this course, the student will be able to:

- CO-1. Explain unit, integration and system test phases along with the nature of defects that the respective phases can detect
- CO-2. Illustrate the process of designing tests for software program validation using functional testing techniques such as equivalence class partitioning, boundary value analysis and decision tables ensuring test adequacy
- CO-3. Design tests for software program validation using structural and data-flow testing techniques satisfying coverage criteria
- CO-4. Apply appropriate testing methods to validate Graphical User Interface based software
- CO-5. Apply test methodologies including model-based testing for validation of object-oriented software at different levels
- CO-6. Apply test-driven development methods to create software programs

Course Outcomes (COs)

Course Title & Code: Service Oriented Architecture (CSE407A)

After the successful completion of this course, the student will be able to:

- CO-1. Intended Learning Outcome
- CO-2. Explain software oriented architectures
- CO-3. Design medium scale software project development using SOA principles
- CO-4. Develop SOA messages from business use cases
- CO-5. Design and implementation of modern SOA and SOA-specific methodologies, technologies and standards
- CO-6. Create composite services by applying composition style

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Course Outcomes (COs)

Course Title & Code: Computer Vision (CSC309A)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss fundamentals of Digital Images with Image Formation and processing
- CO-2. To Discuss Image processing Techniques
- CO-3. Analyze and apply Image processing algorithms to solve recent computer vision problems.
- CO-4. Gather a basic understanding about the geo-metric relationships between 2D images world.
- CO-5. Apply classification, clustering algorithms for a given computer vision application
- CO-6. Implement machine learning algorithms for computer vision applications

Course Outcomes (COs)

Course Title & Code: Text Mining (ISE402A)

After the successful completion of this course, the student will be able to:

- CO-1. E To apply basic methods for information extraction for retrieval of textual data.
- CO-2. To apply text processing techniques to prepare documents for statistical modelling.
- CO-3. To develop proper machine learning models for analyzing textual data and correctly interpreting the results.
- CO-4. To use relevant machine learning models for text prediction
- CO-5. To evaluate the performance of machine learning models for textual data.
- CO-6. To visualize text mining and machine learning results for various application

Course Outcomes (COs)

Course Title & Code: Internet of Things (ISE404A)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss the need and importance of IoT in present day communication networks
- CO-2. Explain the architectural overview and reference architecture of IoT
- CO-3. Describe popular IoT protocols and standards for different IoT applications
- CO-4. Recommend appropriate IoT devices and protocols for given applications
- CO-5. Integrate sensors, actuators, gateways, displays and cloud for IoT applications
- CO-6. Develop IoT applications for industry specific requirements and analyze the obtained data



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Course Outcomes (COs)

Course Title & Code: Principles and Practices of Cryptography (CSE302A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe techniques used for confidentiality and integrity in computing systems
- CO-2. Discuss the importance, working and application of techniques to ensure confidentiality and integrity
- CO-3. Compare and choose appropriate cryptographic techniques for a given scenario.
- CO-4. Identify confidentiality and integrity issues in code review and suggest appropriate countermeasures
- CO-5. Design secure applications using appropriate cryptographic techniques
- CO-6. Develop security subsystems using appropriate cryptographic techniques

Course Outcomes (COs)

Course Title & Code: Quantum Computing (MCC309A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the quantum mechanical, computational and information theoretical concepts underlying quantum computing
- CO-2. Describe the concepts of quantum computation, quantum circuits and quantum information theory
- CO-3. Explain the architectural and programming principles of quantum computing
- CO-4. Explain the principles of quantum algorithms and their applications
- CO-5. Analyse simple quantum computing circuits and algorithms
- CO-6. Design quantum algorithms for a given application

Course Outcomes (COs)

Course Title & Code: Theory of Computation (MCE401A)

After the successful completion of this course, the student will be able to:

- CO-1. Discuss the need for powerful models of general purpose computers and the notion of an algorithm using Turing machines
- CO-2. Explain the concept of reducibility to prove that some problems are unsolvable
- CO-3. Apply the concepts of decidability, halting problem and the diagonalization method on chosen problems
- CO-4. Prove Recursion theorem and discuss its applications
- CO-5. Analyze time, memory or other resources required for solving computational problems discussing their complexity with classification into appropriate classes
- CO-6. Apply necessary theory to show the intractability of chosen computational problems

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Course Outcomes (COs)

Course Title & Code: **Wireless Networks (CSE303A)**

After the successful completion of this course, the student will be able to:

- CO-1. Explain wireless communication protocols and their use in developing network applications
- CO-2. Compare and choose suitable networking protocols for wireless networks
- CO-3. Design and model wireless networks for specified applications
- CO-4. Simulate the modelled wireless networks using appropriately chosen simulation tools
- CO-5. Analyze the performance of network protocols using appropriate methods
- CO-6. Solve problems associated with the design and performance analysis of networking subsystem of computer applications

Course Outcomes (COs)

Course Title & Code: **Software Defined Networking (CSE406A)**

After the successful completion of this course, the student will be able to:

- CO-1. Describe the limitations of traditional networking architectures Classify and describe types of digital circuits
- CO-2. Explain the significance and role of SDN architecture in present day networks Analyze practical problems and develop logic design to solve the problems
- CO-3. Discuss and recommend SDN based protocols, controllers and implementations for networking
- CO-4. Synthesize SDN applications using appropriate protocols and techniques
- CO-5. Develop and conceptualize SDN based solutions for sample use cases used in the industry
- CO-6. Analyze the functionality and performance of the developed SDN based solutions for networking use cases

Course Outcomes (COs)

Course Title & Code: **Advanced Mathematics (MTE302A)**

After the successful completion of this course, the student will be able to:

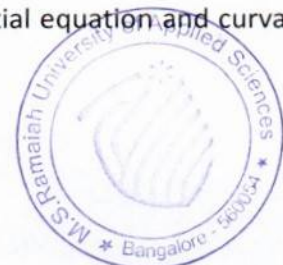
- CO-1. Define and explain Legendre and Bessel differential equation, curvature, torsion, geodesics, manifolds and tensors
- CO-2. State the results and theorems and solve simple problems in Legendre differential equations, Bessel differential equation, theory of curves and surfaces
- CO-3. Apply differential geometry techniques to compute Gaussian curvature, mean curvature, principal curvature and torsion
- CO-4. Solve complex engineering problems associated with Bessel differential equation, theory of curves and surfaces, orthogonal curvilinear coordinates and spherical curvilinear system
- CO-5. Analyze real world problems associated with Bessel differential equation and curvature of space curves



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Course Outcomes (COs)

Course Title & Code: Optimization Techniques (MTE401A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe fundamentals of convex and concave functions, linear programming and constraint nonlinear optimization
- CO-2. State and explain important classical techniques and numerical methods of constraint optimization
- CO-3. Demonstrate the skill to analyze a problem by choosing effective optimization tools
- CO-4. Apply optimization techniques to model real world problems
- CO-5. Solve complex problems associated with linear programming and constraint optimization of function of several variables

Course Outcomes (COs)

Course Title & Code: Advanced Numerical Methods (MTE403A)

After the successful completion of this course, the student will be able to:

- CO-1. Illustrate various methods of numerical computation of Eigen values
- CO-2. Illustrate various methods to solve partial differential equations
- CO-3. Apply numerical methods to solve partial differential equations using MATLAB
- CO-4. Analyze real world problems associated with computing eigenvalues and partial differential equations
- CO-5. Solve complex problems arising in real world using finite volume and finite elements methods to solve partial differential equations

Course Outcomes (COs)

Course Title & Code: Data Mining (CSE421A)

After the successful completion of this course, the student will be able to:

- CO-1. Describe the conceptual framework of classification and clustering
- CO-2. Explain the principles of supervised and unsupervised learning algorithms, training and test data
- CO-3. Apply machine learning techniques to solve problems of practical importance
- CO-4. Analyse the given data using classification and clustering algorithms
- CO-5. Synthesise and solve data mining problems of practical importance using theoretical analysis and software tools



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