

# SREE NARAYANA GURUKULAM COLLEGE OF ENGINEERING

[Affiliated to APJ Abdul Kalam Technological University, Kerala]  
Kadayiruppu P O, Ernakulam, Kerala – 682 311

**SREENARAYANA GURUKULAM COLLEGE OF ENGINEERING ,KADAYIRUPPU**

**Department of Computer Applications**

**Master of Computer Applications**

**Semester I**

Course Code & Course Name	CO No	CO Description
20MCA101 MATHEMATICAL FOUNDATIONS FOR COMPUTING	CO1	Understand mathematical reasoning in order to read, comprehend and construct mathematical arguments
	CO2	Count or enumerate objects and solve counting problems and analyze algorithms
	CO3	Solve problems in almost every conceivable discipline using graph models
	CO4	Solve the linear system of equations and Calculate the eigen values and eigen vectors of matrices.
	CO5	Apply the principles of correlation and regression in practical problems.
20MCA103 DIGITAL FUNDAMENTALS & COMPUTER ARCHITECTURE	CO1	Apply the basics of digital electronics to design and realize simple combinational logic circuits
	CO2	Apply the digital electronics principles to design sequential logic circuits.
	CO3	Understand the different design features of computer architecture, Five key components of a computer, processor and memory making technologies, addressing modes & instruction formats.
	CO4	Understand Processor logic design conventions and data path, pipelining and hazards, I/O organization, Interrupts and direct memory access
	CO5	Understand and different types of memories - RAM, ROM, Cache memory, virtual memory etc. Apply the different memory design techniques.
	CO6	Understand the concept of single board computers like Arduino, Raspberry Pi etc. and apply the same in practical applications

  
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20MCA105 ADVANCED DATA STRUCTURES	CO1	Remember the Basic Data Structures and understand the Set Data Structure and its implementation.
	CO2	Understand Advanced Tree Structures for the design of efficient algorithm
	CO3	Understand Advanced Heap Structures suitable for solving Computational problems involving Optimisation and analysing these data structures using amortised analysis.
	CO4	Understand Advanced Graph algorithms suitable for solving advanced computational problems
	CO5	Understand the basic operation of Blockchaining along with the data structures used in it and the challenges in Blockchain data.
20MCA107 ADVANCED SOFTWARE ENGINEERING	CO1	Get a full view of the Software life cycle
	CO2	Gain a deep knowledge of Software Planning, Analysis and Design and Software Engineering Models
	CO3	Have a great comprehension of Coding Practices, Version Control using 'git' and Software Quality
	CO4	Acquire ample grasp of Design Patterns
	CO5	Get deeply familiarised with Software Testing and its automation
	CO6	Start using Agile Methodology
	CO7	Begin to apply CI/CD techniques in Software development
20MCA131 PROGRAMMING LAB	CO1	Understands basics of Python Programming language including input/output functions, operators, basic and collection data types
	CO2	Implement decision making, looping constructs and functions
	CO3	Design modules and packages - built in and user defined packages
	CO4	Implement object-oriented programming and exception handling
	CO5	Create files and form regular expressions for effective search operations on strings and files.
20MCA133 WEB PROGRAMMING LAB	CO1	Explore markup languages features and create interactive web pages using them.
	CO2	Learn and design client-side validation using scripting languages.
	CO3	Design front end web page and connect to the back-end databases.
	CO4	Do Client-side & Server-side scripting

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	CO5	Develop Web Applications
20MCA135 DATA STRUCTURES LAB	CO1	Use Debuggers, Profilers and advanced Compiler options.
	CO2	Implement the Set and Disjoint Set Data Structures.
	CO3	Understand the practical aspects of Advanced Tree Structures.
	CO4	Realise Modern Heap Structures for effectively solving advanced Computational problems.
	CO5	Implement Advanced Graph algorithms suitable for solving advanced computational problems.

<b>Semester II</b>		
Course Code & Course Name	CO No	CO Description
20MCA102 ADVANCED DATABASE MANAGEMENT SYSTEMS	CO1	Understand the fundamentals of relational database systems including: data models, database architectures and ER features
	CO2	Analyze and apply the different normalization techniques.
	CO3	Assess the basic issues of transaction processing and concurrency control
	CO4	Understand the roles that databases play in organizations and familiarize with basic database storage, file organization, database accessing techniques.
	CO5	Understand the basics of query processing, object-oriented, distributed databases.
20MCA104 ADVANCED COMPUTER NETWORKS	CO1	Comprehend the terminology and concepts of basic communication model, analyse the protocol layers and design application layer protocols.
	CO2	Understand and analyse the various transport layer protocols.
	CO3	Compare and contrast various routing algorithms in the network layer.
	CO4	Understand and analyse the concepts of link layer and physical layer.
	CO5	Understand how modern cellular and wireless networks work


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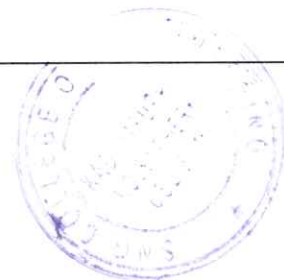


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20MCA162 APPLIED STATISTICS	CO1	Apply the concept of discrete probability distributions in determining the parameters of the distribution and hence to solve different problems
	CO2	Apply the concept of continuous probability distribution in solving different problems
	CO3	Apply the principles of correlation and regression in practical problems.
	CO4	Develop confidence intervals for various problems.
	CO5	Test the given hypothesis on the basis of known criteria.
20MCA164 ORGANIZATIONAL BEHAVIOUR	CO1	Identify managers' challenges and opportunities in applying OB concepts
	CO2	Analyse various characteristics of individual behaviour and its impact on organizational performance.
	CO3	Acquire knowledge about the complexities associated with management of individual behaviour in the organization.
	CO4	Understand group behaviour and develop inter-personal skills and group dynamics.
	CO5	Understand organizational structures and analyze the behavioral implications of different organizational designs.
20MCA168 VIRTUALISATION AND CONTAINERS	CO1	Understand the basics of virtualization technology, architecture, limitations and applications.
	CO2	Apply Networking Principles to setup virtual machines and connect to the network
	CO3	Understand the basics of VM life cycle, VM migrations, VM scheduling and load balancing
	CO4	Understand Container fundamentals including how to configure and set up a container
	CO5	Understand the basics of security, troubleshooting and monitoring aspects in container technology
	CO6	Apply the knowledge in Virtualization and docker to setup VM and dockers.
20MCA182 BUSINESS MANAGEMENT	CO1	Understand management as a process.

  
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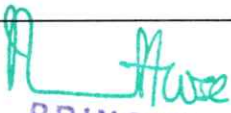




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	CO2	Critically analyse and evaluate management theories and practices
	CO3	Perform planning and organising for an organisation
	CO4	Do staffing and related human resource development function
	CO5	Take proper decisions to get competitive advantage
	CO6	Understand basic concepts in book keeping and accounting.
20MCA186 COMPUTER GRAPHICS	CO1	Apply foundational knowledge in computer graphics to work with Graphics API
	CO2	Explain various shape drawing algorithms and transformations.
	CO3	Explain viewing concepts and follow the workflow in computer graphics pipeline.
	CO4	Explain different shading, texture mapping and data structures used in computer graphics.
	CO5	Apply concepts in Raytracing to better understand and design computer graphics models.
	CO6	Apply concepts in colorimetry and radiometry to work with images.
20MCA188 ARTIFICIAL INTELLIGENCE	GO1	Apply the steps needed to provide a formal specification for solving the problem
	CO2	Apply and analyze the different types of control and heuristic search methods to solve problems
	CO3	Understand various Game theory problems & Knowledge structures
	CO4	Formulate knowledge representation and examine resolution in predicate and propositional logic
	CO5	Apply feasible planning and learning techniques to solve non-trivial problems
	CO6	Analyze expert systems & fuzzy operations to solve real life problems.


  
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20MCA164 ORGANIZATIONAL BEHAVIOUR	CO1	Explain the fundamentals of IPR and patents
	CO2	Apply intellectual property related tools such as trademark and copyright to real problems.
	CO3	Discuss Industrial designs, trade secret and geographic Indications.
	CO4	Describe laws governing cyberspace and analyze the role of Internet Governance in framing policies for Internet security.
	CO5	Discuss different types of cybercrimes and penalties under IT Act
20MCA132 OBJECT ORIENTED PROGRAMMING LAB	CO1	Understand object-oriented concepts and design classes and objects to solve problems
	CO2	Implement arrays and strings
	CO3	Implement object-oriented concepts like inheritance, overloading and interfaces
	CO4	Implement packages, exception handling, multithreading and generic programming. Use java.util package and Collection framework
	CO5	Develop applications to handle events using applets
	CO6	Develop applications using files and networking concepts
20MCA134 ADVANCED DBMS LAB	CO1	Design and build a simple relational database system and demonstrate competence with the fundamentals tasks involved with modelling, designing and implementing a database
	CO2	Apply PL/SQL for processing databases.
	CO3	Comparison between relational and non-relational (NoSQL) databases and the configuration of NoSQL Databases.
	CO4	Apply CRUD operations and retrieve data in a NoSQL environment.
	CO5	Understand the basic storage architecture of distributed file systems.
	CO6	Design and deployment of NoSQL databases with real time requirements.

  
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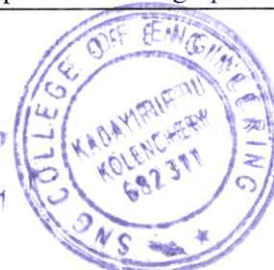
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20MCA136 NETWORKING & SYSTEM ADMINISTRATION LAB	CO1	Install and configure common operating systems.
	CO2	Perform system administration tasks.
	CO3	Perform system administration tasks.
	CO4	Write shell scripts required for system administration.
	CO5	Acquire skill sets required for a DevOp

### Semester III

Course Code & Course Name	CO No	CO Description
20MCA201 DATA SCIENCE & MACHINE LEARNING	CO1	Discuss the fundamental concepts of data science and data visualization techniques.
	CO2	Explain the basics of machine learning and use lazy learning and probabilistic learning algorithms to solve data science problems.
	CO3	Describe decision trees, classification rules & regression methods and how these algorithms can be applied to solve data science problems.
	CO4	Solve data science problems using neural networks and support vector machines.
	CO5	Discuss clustering using k-means algorithm and evaluate & improve the performance of machine learning classification models.
20MCA203 DESIGN & ANALYSIS OF ALGORITHMS	CO1	Discuss the basic concepts in computer algorithms and their analysis & design using Divide and Conquer.
	CO2	Explain the concepts of Greedy Strategy and Dynamic Programming to use it in solving real world problems
	CO3	Explain the Branch & Bound technique, Backtracking technique and Lower bounds.
	CO4	Describe the fundamental concepts of Computational Complexity and Network Flows
	CO5	Discuss the concepts of Approximation and Randomised Algorithms.
20MCA261 OPERATIONS RESEARCH	CO1	Solve different types of Linear Programming Problems.
	CO2	Apply the concept of linear programming problems in real life.
	CO3	Solve different decision-making problems using optimization techniques.

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	CO4	Use PERT and CPM to analyse project network management.
	CO5	Identify suitable queuing model and solve queuing problems.
20MCA263 CYBER SECURITY & CRYPTOGRAPHY	CO1	Explain various types of security attacks, security mechanisms, security services and classical encryption techniques.
	CO2	Make use of Symmetric and Asymmetric encryption techniques to solve cryptographic problems.
	CO3	Describe the concepts of message authentication codes, hash functions and digital signing techniques for ensuring secure transactions.
	CO4	Discuss security services in Application, Transport and Network layers.
	CO5	Explain common web application security vulnerabilities and various prevention mechanisms.
20MCA265 Cloud Computing	CO1	Understand the basic concepts in cloud computing and OpenStack logical architecture
	CO2	Discuss OpenStack cloud controller and common services
	CO3	Compare different OpenStack compute service components and storage types
	CO4	Describe the OpenStack Networking- Connection types and networking services
	CO5	Discuss orchestration, HA and failover in OpenStack
20MCA267 CYBER FORENSICS	CO1	Explain a computer crime and the concept of rules or policy violations.
	CO2	Gather evidences and preserve the collected evidence with the required knowledge on various storage format choices.
	CO3	Describe digital storage and file systems and extract data using Autopsy.
	CO4	Explain mobile device forensics and practice data acquisition procedures for network forensics using Wireshark.
	CO5	Prepare forensics reports both using tools and manually and explain ethics and code for expert witness.
20MCA269 COMPILER DESIGN	CO1	Explain different phases of compiler and perform lexical analysis using the concepts of regular expressions and finite automata
	CO2	Develop top down and bottom-up parsers to perform syntax analysis using context free grammar
	CO3	Explain syntax directed translation schemes and type checking for a given grammar.
	CO4	Distinguish different intermediate code representations and generate intermediate code for statements in high level languages.
	CO5	Describe various code optimization techniques and generate machine dependent code.
20MCA281 INTERNET OF	CO1	Describe the main concepts and features of the IOT paradigm.
	CO2	Discuss Fog computing, TinyOS - nesC and programming frameworks for

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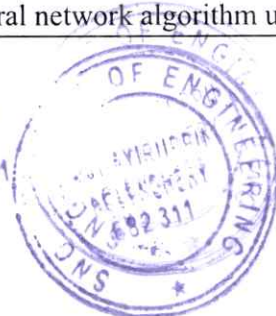


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THINGS	IOT
	CO3 Describe the data management techniques applied to the IOT environment.
	CO4 Explain security, and privacy in IOT environments
	CO5 Discuss key enablers and solutions to enable practical IoT systems
20MCA283 DEEP LEARNING	CO1 Explain the basic concepts of deep learning.
	CO2 Design neural networks using TensorFlow
	CO3 Solve real world problems with CNN
	CO4 Solve real world problems with RNN.
	CO5 Describe the concepts of GAN
20MCA285 DIGITAL IMAGE PROCESSING	CO1 Discuss the fundamental concepts of digital image processing, image formation and representation of images.
	CO2 Summarise image enhancement methods in the spatial domain.
	CO3 Explain image transforms and image smoothing & sharpening using various kinds of filters in frequency domain
	CO4 Describe various methods in image restoration and compression.
	CO5 Discuss morphological basics and image segmentation methods.
20MCA285 DIGITAL IMAGE PROCESSING	CO1 Discuss the fundamental concepts of digital image processing, image formation and representation of images.
	CO2 Summarise image enhancement methods in the spatial domain.
	CO3 Explain image transforms and image smoothing & sharpening using various kinds of filters in frequency domain
	CO4 Describe various methods in image restoration and compression
	CO5 Discuss morphological basics and image segmentation methods
20MCA289 SOCIAL NETWORK ANALYSIS	CO1 Explain the basic concepts of semantic web and social network analysis.
	CO2 Describe the ontology-based knowledge representation techniques in social network.
	CO3 Discuss aggregation of social network information and representation of social individuals and social relationships.
	CO4 Describe the structure of the Web and Facebook as a graph and the algorithms for searching and community discovery
	CO5 Explain the general architecture of a search engine and specifically the Google search engine architecture.
20MCA241 DATA SCIENCE LAB	CO1 Use different python packages to perform numerical calculations, statistical computations and data visualization
	CO2 Use different packages and frameworks to implement regression and classification algorithms.
	CO3 Use different packages and frameworks to implement text classification using SVM and clustering using k-means
	CO4 Implement convolutional neural network algorithm using Keras framework

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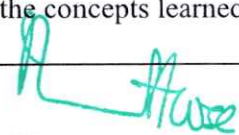


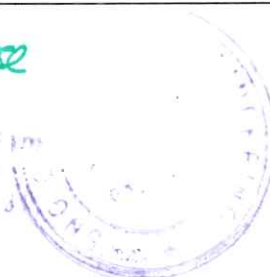
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	CO5	Implement programs for web data mining and natural language processing using NLTK
20MCA243 MOBILE APPLICATION DEVELOPMENT LAB	CO1	Design and develop user interfaces for mobile apps using basic building blocks, UI components and application structure using Emulator
	CO2	Write simple programs and develop small applications using the concepts of UI design, layouts and preferences
	CO3	Develop applications with multiple activities using intents, array adapter, exceptions and options menu.
	CO4	Implement activities with dialogs, spinner, fragments and navigation drawer by applying themes
	CO5	Develop mobile applications using SQLite
20MCA245 MINI PROJECT	CO1	Identify a real-life project which is useful to society / industry
	CO2	Interact with people to identify the project requirements
	CO3	Apply suitable development methodology for the development of the product / project
	CO4	Analyse and design a software product / project
	CO5	Test the modules at various stages of project development
	CO6	Build and integrate different software modules
	CO7	Document and deploy the product / projec
20MCA243 MOBILE APPLICATION DEVELOPMENT LAB	CO1	Associate real-life problems with IT solution
	CO2	Describe latest developments in IT field
	CO3	Interact with technical experts
	CO4	Prepare technical documents
	CO5	Present a topic before an audience

Semester IV		
Course Code & Course Name	CO No	CO Description
20MCA242 COMPREHENSIVE VIVA	CO1	Articulate the concepts in the core courses learned through this programme
	CO2	Attend technical interviews with confidence.
	CO3	Interpret questions and answer them with clarity
	CO4	Make use of the concepts learned through this programme in future.

  
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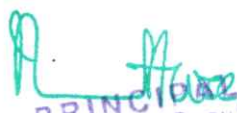




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20MCA244 SEMINAR	CO1	Annotate the ideas presented in technical papers
	CO2	Comprehend a concept by referring different technical documents
	CO3	Prepare technical documents
	CO4	Present a topic before an audience
	CO5	Interact with the audience
20MCA246 MAIN PROJECT	CO1	Identify a real-life project which is useful to society / industry
	CO2	Interact with people to identify the project requirements
	CO3	Apply suitable development methodology for the development of the product / project
	CO4	Analyse and design a software product / project
	CO5	Test the modules at various stages of project development
	CO6	Build and integrate different software modules
	CO7	Document and deploy the product / project

  
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