Dr.Y.S.R Government Degree College, Vedurukuppam

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COURSE OUTCOMES (2023)

S.No	Code	Title of the Suject	Outcomes
1.		**Essentials and applications of Mathematical, Physical and Chemical Sciences**	Upon successful completion of the course, a student will be able to: **CO1:** Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures. **CO2:** To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations **CO3:** To Explain the basic principles and concepts underlying a broad range of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life. **CO4:** Understand the interplay and connections between mathematics, physics, and chemistry in various applications. Recognize how mathematical models and physical and chemical **CO5:** principles can be used to explain and predict phenomena in different contexts. **CO6:** To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures.
2.		**Advances in Mathematical, Physical and Chemical Sciences**	Upon successful completion of the course, a student will be able to: **CO1:** Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems. **CO2:** To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations. **CO3:** Understand the different sources of renewable energy and their generation processes and advances in nanomaterials and their properties, with a focus on quantum dots. **CO4:** To study the emerging field of quantum communication and its potential applications. To gain an understanding of the principles of biophysics in studying biological systems. Explore the properties and applications of shape memory materials. **CO5:** Understand the principles and techniques used in computer-aided drug design and drug delivery systems, to understand the fabrication techniques and working principles of nanosensors.

			Explore the effects of chemical pollutants on ecosystems and human health. **CO6:** Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts. **CO7:** Understand and convert between different number systems, such as binary, octal, decimal, and hexadecimal. Differentiate between analog and digital signals and understand their characteristics. **CO8:** Gain knowledge of different types of transmission media, such as wired (e.g., copper cables, fiber optics) and wireless (e.g., radio waves, microwave, satellite)..
3.		**Problem Solving using C (T)**	Upon successful completion of the course, a student will be able to: **CO1:** Understand the working of a digital computer and Fundamental constructs of Programming **CO2**: Analyze and develop a solution to a given problem with suitable control structures **CO3:** Apply the derived data types in program solutions **CO4:** Use the 'C' language constructs in the right way **CO5:** Apply the Dynamic Memory Management for effective memory utilization.
4.		**Digital Logic Design (T)**	Upon successful completion of the course, the students will be able to **CO1:** Understand how to Convert numbers from one radix to another radix and perform arithmetic operations. **CO2:** Simplify Boolean functions using Boolean algebra and k- maps **CO3:** Design adders and subtractors circuits **CO4:** Design combinational logic circuits such as decoders, encoders, multiplexers and demultiplexers. **CO5:** Use flip flops to design registers and counters.
5.		**Object Oriented Programming using Java (T)**	Upon successful completion of the course, a student will be able to: **CO1:** Understand the basic concepts of Object-Oriented Programming and Java Program Constructs. **CO2:** Implement classes and objects and analyze Inheritance and Dynamic Method Dispatch. **CO3:** Demonstrate various classes in different packages and can design own packages. **CO4:** Manage Exceptions and Apply Threads. **CO5:** Create GUI screens along with event handling.
9.		**Data Structures using C (T)**	Upon successful completion of the course, a

			student will be able to: **CO1:** Understand various Data Structures for data storage and processing. **CO2:** Realize Linked List Data Structure for various operations **CO3:** Analyze step by step and develop algorithms to solve real world problems by implementing Stacks, Queues data structures. **CO4:** Understand and implement various searching & sorting techniques. **CO5:** Understand the Non-Linear Data Structures such as Binary Trees and Graphs
10.		**Computer Organization (T)**	Upon successful completion of the course, the students will be able to **CO1:**Identify different types of instructions **CO2:** Differentiate between micro-programmed and hard-wired control units. **CO3:** Analyze the performance of hierarchical organization of memory. **CO4:** Summarize different data transfer techniques. **CO5:** Demonstrate arithmetic operations on fixed- and floating-point numbers and illustrate concepts of parallel processing.
11.		**Operating Systems (T)**	Upon successful completion of the course, a student will be able to: **CO1:** Demonstrate knowledge and comprehension of operating system functions. **CO2:** Analyze different process scheduling algorithms and apply them to manage processes and threads effectively **CO3:** Create strategies to prevent, detect, and recover from deadlocks, and design solutions for inter-process communication and synchronization problems. **CO4:** Compare and contrast different memory allocation strategies and evaluate their effectiveness **CO5:** Evaluate disk scheduling algorithms while implementing OS security measures
12.		**Database Management System (T)**	On successful completion of the course, students will be able to **CO1:** Differentiate between database systems and file based systems **CO2:** Design a database using ER model **CO3:** Use relational model in database design **CO4:** Use SQL commands for creating and manipulating data stored in databases. **CO5:** Write PL/SQL programs to work with databases.
13.		**Object Oriented Software Engineering (T)**	Upon successful completion of the course, a student will be able to: **CO1:** Understand and apply the fundamental principles of Object-Oriented Programming (OOP) concepts and Unified Modeling Language (UML) basics, in the development of software solutions. **CO2:** Analyze and specify software requirements, develop use cases and scenarios, apply object-

			oriented analysis and design (OOAD) principles **CO3:** Familiar with the concept of test-driven development (TDD) and its practical implementation **CO4:** Analyze and Evaluate Software Maintenance and Evolution Strategies **CO5:** Apply Advanced Object-Oriented Software Engineering Concepts.
14.		**Data Communications and Computer Networks (T)**	Upon successful completion of the course, a student will be able to: **CO1:** Understand and apply network applications, hardware, software, and reference models for network communication. **CO2:** Design and analyze data link layer protocols, multiple access protocols, and wireless LAN technologies. **CO3:** Design routing algorithms, congestion control algorithms, and evaluate network layer protocols for internetworking. **CO4:** Analyze transport service, transport protocols, and evaluate UDP and TCP in the internet. **CO5:** Understand and evaluate application layer protocols, including DNS, email, WWW, and network management protocols.
15.		**Web Interface Designing Technologies (T)**	On successful completion of the course, students will be able to **CO1:** Understand and appreciate the web architecture and services along with its basic building blocks **CO2:** Gain knowledge about various components of a website related to aesthetics **CO3:** Demonstrate skills regarding creation of a static website and addition of dynamic behavior to a website **CO4:** Get experience on making user-interactive web pages. **CO5:** Learn how to install word press and gain the knowledge of installing various plugins to use in their websites.
16.		**Web Applications Development using PHP & MYSQL (T)**	On successful completion of the course, students will be able to **CO1:** Write simple programs in PHP. **CO2:** Understand how to use regular expressions, handle exceptions, and validate data using PHP. **CO3:** Apply In-Built functions and Create User defined functions in PHP programming. **CO4:** Write PHP scripts to handle HTML forms. **CO5:** Know how to use PHP with a MySQL database and can write database driven web pages.
17.		**Internet of Things (T)**	On successful completion of the course, students will be able to **CO1:** Understand various concepts, terminologies and applications of IoT **CO2:** Learn how to build IoT devices with development boards **CO3:** Understand various Wireless protocols for

			IoT **CO4:** Learn how to use various sensors and actuators & develop IoT solutions using Arduino **CO5:** Develop and Connect IoT with Cloud Platforms.
18.		**Foundations of Data Science (T)**	On successful completion of the course, students will be able to **CO1:** Identify the need for data science and understand various data collection strategies **CO2:** Understand about NoSQL and Descriptive Statistics **CO3:** Apply Numpy methods to process the data in an array. **CO4:** Summarize and Compute Descriptive Statistics using Pandas. **CO5:** Apply powerful data manipulations visualization using Pandas
19.		**IoT Applications Development and Programming -(T)**	On successful completion of the course, students will be able to **CO1:** Understand the Basic Concepts of Internet of Things **CO2:** Learn various Sensors and their associative protocols **CO3:** Learn the Single Board Computers for development of IoT **CO4:** Build the IoT devices with the Node-RED without Complex coding **CO5:** Develop various IoT real-time applications
20.		**Application development using Python -(T)**	On successful completion of the course, students will be able to **CO1:** Examine Python syntax and semantics and be fluent in the use of Python flow control and functions. **CO2:** Demonstrate proficiency in handling Strings and File Systems. **CO3:** Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions. **CO4:** Interpret the concepts of Web Programming and GUI in Python **CO5:** Apply concepts of Python programming in various fields related to IOT, Web Services and Databases in Python.
21.		**Advanced Data Structures -(T)**	Upon completion of the course, students will be able to: **CO1:** Apply appropriate hashing techniques for a given problem. **CO2:** Simulate the operations of Heap trees. **CO3:**Provide solutions using multi-way search trees. **CO4:** Choose appropriate algorithm while establishing a network. **CO5:** Apply the knowledge of disjoint sets for solving a given problem.
22.		**Artificial Intelligence -(T)**	Students after successful completion of the course will be able to: **CO1:** Analyze AI problems and search techniques using underlying assumptions and AI

			techniques. **CO2:** Apply heuristic search techniques for problem-solving and optimization. **CO3:** Understand knowledge representation approaches and apply predicate logic for representing facts and relationships. **CO4:** Utilize rule-based systems for representing knowledge and apply reasoning techniques for problem-solving. **CO5:** Implement symbolic reasoning under uncertainty and augment problem-solving strategies with non-monotonic reasoning.
23.		**Computer Graphics -(T)**	Students after successful completion of the course will be able to: **CO1:** Understand computer graphics fundamentals **CO2:** Perform 2D and 3D **CO3:** Apply window-to-view port transformation and perform line and polygon clipping operations. **CO4:** Determine visible surfaces and apply computer graphics algorithms for depth comparison, back-face removal, and rendering. **CO5:** Apply animation principles, work with Flash interface, and gain an introduction to virtual reality.
24.		**Design and Analysis of Algorithms -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Understand the fundamental concepts of algorithm analysis and design techniques. **CO2:** Apply divide and conquer design techniques for solving problems **CO3:** Analyze the performance of given problem using greedy approach. **CO4:** Analyze the given problem and provide the feasible solution using dynamic programming. **CO5:** Analyze the complexity of a given problem.
25.		**Principles of Machine Learning -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Understand the features of machine learning to apply on real world problems. **CO2:** Characterize the machine learning algorithms as supervised learning and unsupervised learning, apply and analyze the various algorithms of supervised and unsupervised learning. **CO3:** Analyze the concept of neural networks for learning linear and non-linear activation functions. **CO4:** Identify an appropriate clustering technique to solve real world problems. **CO5:** Choose a suitable machine learning model, implement and examine the performance of the chosen model for a given real world problems.
26.		**Software Testing-(T)**	**CO1:** Upon successful completion of the course, students will be able to: Understand software testing principles and apply effective test case design strategies. **CO2:** Implement and execute different levels of testing

			CO3: Utilize Selenium for automation testing, including handling web elements and utilizing advanced features. **CO4:** Implement and leverage automation testing frameworks for efficient test automation. **CO5:** Apply TestNG framework for advanced test execution, management, and parallel processing.
27.		**Advanced Java Programming -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Understand the multi-tier architecture of J2EE and its implementation in enterprise applications. **CO2:** Develop web applications using Java Servlets and establish database connectivity with JDBC. **CO3:** Create dynamic and interactive web pages using Java Server Pages (JSP) and implement JSP with beans and custom tag libraries. **CO4:** Build enterprise applications using Enterprise Java Beans (EJB) and understand their deployment and configuration. **CO5:** Utilize various Java technologies such as JavaMail, CORBA, and Java RMI for effective communication and distributed computing.
28.		**Mobile Application Development -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Gain a solid understanding of mobile application development principles **CO2:** Develop proficiency in setting up the Android development environment **CO3:** Acquire the necessary skills to handle and manage Android resources effectively **CO4:** Develop expertise in designing user interfaces by utilizing a wide range of UI widgets **CO5:** Learn various storage techniques in Android and Understand how to integrate web applications
29.		**R Programming -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Gain a solid understanding of R programming language **CO2:** Acquire knowledge and skills in manipulating matrices, lists, and data frames, including performing operations and applying functions. **CO3:** Develop the ability to create user-defined functions, handle variable scope, and perform exploratory data analysis, including data preprocessing and descriptive statistics. **CO4:** Learn various data visualization techniques in R, including basic and advanced visualizations, as well as creating 3D plots. **CO5:** Gain proficiency in inferential statistics and regression analysis using R, including simple linear regression and multiple linear regression.
30.		**Big Data Technologies -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Understand the importance and challenges of Big Data, including its classification and

			applications. **CO2:** Familiarize with Apache Hadoop and learn data movement and MapReduce algorithms. **CO3:** Explore Hadoop architecture, including HDFS, MapReduce tasks, and cluster setup. **CO4:** Develop skills in Hive and HiveQL for querying and analyzing data in Hadoop. **CO5:** Gain proficiency in HBase, including schema design, advanced indexing, and working with Zookeeper for cluster monitoring.
31.		**Compiler Design -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Understand the compiler structure and the process of lexical analysis using finite automata. **CO2:** Acquire knowledge of syntax analysis techniques, including recursive descent parsing, predictive parsing, and LR parsing. **CO3:** Learn about syntax-directed translation, intermediate code generation, and error detection and recovery methods in compilers. **CO4:** Explore storage organization, dynamic storage allocation, error recovery methods, and code generation issues in compilers. **CO5:** Develop an understanding of code optimization techniques, machine-dependent optimization, register allocation, and machine-independent optimization in compilers.
32.		**Data Mining Concepts & Techniques -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Understand data warehousing concepts, including data warehouse architecture, multidimensional data models, and OLAP operations. **CO2:** Explore the fundamentals of data mining, including its definition, techniques, and applications in real-world scenarios. **CO3:** Develop knowledge and skills in clustering techniques, including partitioning algorithms, hierarchical clustering, and categorical clustering. **CO4:** Acquire proficiency in decision tree construction and the use of decision tree algorithms for data analysis and prediction. **CO5:** Gain exposure to various advanced data mining techniques, such as neural networks, genetic algorithms, and text mining, including web mining concepts and applications.
33.		**Digital Image Processing -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Understand digital image processing fundamentals and applications in various domains. **CO2:** Develop skills in spatial domain image enhancement techniques **CO3:** Acquire proficiency in frequency domain image enhancement **CO4:** Master in image segmentation techniques **CO5:** Learn image compression principles.
34.		**Information Security and**	Upon successful completion of the course,

		Cryptography -(T)	students will be able to: **CO1:** Demonstrate the knowledge of cryptography, network security concepts and applications. **CO2:** Develop security mechanisms to protect computer systems and networks. **CO3:** Apply security principles in system design. **CO4:** Apply methods for authentication, access control, intrusion detection and prevention. **CO5:** Ability to identify and investigate vulnerabilities and security threats and mechanisms to counter them.
35.		**Mobile ADHOC and Sensor Networks -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Understand the concept of ad-hoc and sensor networks, their applications and typical node and network architectures. **CO2:** Describe the MAC protocol issues of ad hoc networks. **CO3:** Identify and describe routing protocols for ad hoc wireless networks with respect to TCP design issues. **CO4:** Explain the concepts of network architecture and MAC layer protocol for WSN. **CO5:** Familiar with the OS used in Wireless Sensor Networks and build basic modules.
36.		**Advanced DBMS -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Gain understanding of relational database concepts, functional dependencies, and correctness of FDs. **CO2:** Analyze and apply normalization techniques (3NF, BCNF, 4NF, 5NF) **CO3:** Develop skills in processing joins, grasp materialized vs. pipelined processing **CO4:** Learn principles of correct interleaved execution, locking mechanisms (2PL), handle deadlocks. **CO5:** Acquire knowledge of T/O-based techniques, multi-version approaches.
37.		**Cloud Computing -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Understand the essential characteristics and benefits of cloud computing **CO2:** Gain knowledge of virtualization technologies **CO3:**Explore Microsoft implementation of virtualization and understand different cloud deployment models and their advantages. **CO4:** Learn about Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) models, **CO5:** Explore Software as a Service (SaaS) and its service providers.
38.		**Computer Vision -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Understand the fundamental concepts of computer vision and its applications in various domains.

			CO2: Apply color and geometric transforms, edge-detection techniques, filtering, and mathematical operations to analyze images. **CO3:** Comprehend the concept of motion estimation and its applications. **CO4:** Apply shape correspondence, shape matching, principal component analysis, and shape priors for object recognition. **CO5:** Explore various applications of computer vision.
39.		**Digital Forensics -(T)**	Upon successful completion of the course, students will be able to: **CO1:** Gain a clear understanding of the fundamentals of digital forensics **CO2:** Develop knowledge and skills in analyzing storage media and file systems **CO3:** Learn about network forensics and acquire practical skills in network packet sniffing, analysis using tools like Wireshark and TCPDUMP **CO4:** Gain expertise in logs and event analysis, data carving **CO5:** Develop proficiency in wireless and web attacks.

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COURSE OUTCOMES (2020)

S.No	Code	Title of the subject	Outcomes
1.	3-1-108R	Problem Solving in C	Upon successful completion of the course, a student will be able to: **CO1:** Understand the evolution and functionality of a Digital Computer. **CO2:** Apply logical skills to analyze a given problem **CO3:** Develop an algorithm for solving a given problem. **CO4:** Understand „C" language constructs like Iterative statements, Array processing, Pointers, etc. **CO5:** Apply "C" language constructs to the algorithms to write a "C" language program.
2.		DATA STRUCTURES USING C	Upon successful completion of the course, a student will be able to: **CO1:** Understand available Data Structures for data storage and processing. **CO2:** Comprehend Data Structure and their real-time applications - Stack, Queue, Linked List, Trees and Graph **CO3:** Choose a suitable Data Structures for an application **CO4:** Develop ability to implement different Sorting and Search methods **CO5:** Have knowledge on Data Structures basic operations like insert, delete, search, update and traversal **CO6:** Design and develop programs using various data structures **CO7:** Implement the applications of algorithms for sorting, pattern matching etc
3.		Database Management Systems	On completing the subject, students will be able to: **CO1:** Gain knowledge of Database and DBMS. **CO2:** Understand the fundamental concepts of DBMS with special emphasis on relational data model.

			CO3: Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database **CO4:** Model database using ER Diagrams and design database schemas based on the model. **CO5:** Create a small database using SQL. **CO6:** Store, Retrieve data in database.
4.		**Object orientated programming through Java**	At the end of this course student will: **CO1:** Understand the benefits of a well-structured program. **CO2:** Understand different computer programming paradigms. **CO3:** Understand underlying principles of Object-Oriented Programming in Java. **CO4:** Develop problem-solving and programming skills using OOP concepts. **CO5:** Develop the ability to solve real-world problems through software development in high-level programming language like Java.
5.		**OPERATING SYSTEMS**	Upon successful completion of the course, a student will be able to: **CO1:** Know Computer system resources and the role of operating system in resource management with algorithms. **CO2:** Understand Operating System Architectural design and its services. **CO3:** Gain knowledge of various types of operating systems including Unix and Android. **CO4:** Understand various process management concepts including scheduling, synchronization, and deadlocks. **CO5:** Have a basic knowledge about multithreading. **CO6:** Comprehend different approaches for memory management. **CO7:** Understand and identify potential threats to operating systems and the security features design to guard against them. **CO8:** Specify objectives of modern operating systems and describe how operating systems have evolved over time. **CO9:** Describe the functions of a contemporary operating system

6A.		**Web Interface Designing Technologies**	Students after successful completion of the course will be able to: **CO1:** Understand and appreciate the web architecture and services. **CO2:** Gain knowledge about various components of a website. **CO3:** Demonstrate skills regarding creation of a static website and an interface to dynamic website. **CO4:** Learn how to install word press and gain the knowledge of installing various plugins to use in their websites.
6B.		**Internet of Things**	Students after successful completion of the course will be able to: **CO1:** Appreciate the technology for IoT. **CO2:** Understand various concepts, terminologies and architecture of IoT systems. **CO3:** Understand various applications of IoT. **CO4:** Learn how to use various sensors and actuators for design of IoT. **CO5:** Learn how to connect various things to Internet. **CO6:** Learn the skills to develop simple IOT Devices.
6C.		**Data science**	Students after successful completion of the course will be able to: **CO1:** Develop relevant programming abilities. **CO2:** Demonstrate proficiency with statistical analysis of data. **CO3:** Develop the ability to build and assess data-based models. **CO4:** Demonstrate skill in data management. **CO5:** Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively.
7A.		**Web Applications Development using PHP& MYSQL**	Students after successful completion of the course will be able to: **CO1:** Write simple programs in PHP. **CO2:** Understand how to use regular expressions, handle exceptions, and validate data using PHP. **CO3:** Apply In-Built functions and Create User defined functions in PHP programming. **CO4:** Write PHP scripts to handle HTML forms. **CO5:** Write programs to create dynamic and interactive web based applications using PHP and MYSQL. **CO6:** Know how to use PHP with a MySQL database and can write database driven web pages.

7B.		**Application Development using Python**	Students after successful completion of the course will be able to: **CO1:** Understand and appreciate the web architecture and services. **CO2:** Examine Python syntax and semantics and be fluent in the use of Python flow control and functions. **CO3:** Demonstrate proficiency in handling Strings and File Systems. **CO4:** Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions. **CO5:** Interpret the concepts of Object-Oriented Programming as used in Python. **CO6:** Apply concepts of Python programming in various fields related to IOT, Web Services and Databases in Python.
7C		**Python for Data science**	Students after successful completion of the course will be able to: **CO1:** Identify the need for data science and solve basic problems using Python built-in data types and their methods. **CO2:** Design an application with user-defined modules and packages using OOP concept. **CO3:** Employ efficient storage and data operations using NumPy arrays. **CO4:** Apply powerful data manipulations using Pandas. **CO5:** Do data pre-processing and visualization using Pandas.

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COURSE OUTCOMES (2016)

1.	**3-1-108R**	**Computer Fundamentals and Programming in C**	After Completion of this course the student would be able to: **CO1:** Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming. **CO2:** Write, compile and debug programs in C language and use different data types for writing the programs. **CO3:** Design programs connecting decision structures, loops and functions. **CO4:** Explain the difference between call by value and call by address. **CO5:** Understand the dynamic behavior of memory by the use of pointers. **CO6:** Use different data structures and create / manipulate basic data files and developing applications for real world problems.
2.	**3-2-109**	**Object Oriented Programming Using C++**	After Completion of this course the student would be able to **CO1:** Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects. **CO2:** Understand dynamic memory management techniques using pointers, constructors, destructors, etc **CO3:** Describe the concept of function overloading, operator overloading, virtual functions and polymorphism. **CO4:** Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming. **CO5:** Demonstrate the use of various OOPs concepts with the help of programs.
3.	**3-3-108**	**Object Oriented Programming Using Java**	After Completion of this course the student would be able to: **CO1:** Understand the use of OOPs concepts. **CO2:** Apply OOPs concepts to solve real world problems **CO3:** Understand the use of abstraction, Packages and Interface in java. **CO4:** Develop Programs for exception handling, multithreaded applications with synchronization. **CO5:** Able to design GUI based applications and develops applets for web applications.

4.	**3-4-108**	**Data Structures**	After Completion of this course the student would be able to: **CO1:** Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms. **CO2:** Apply for arrays, records, linked structures, stacks, queues, trees, and graphs in developing applications. **CO3:** Compare alternative implementations of data structures with respect to performance and benefits of dynamic and static data structures implementations. **CO4:** understand the concept of recursion, and describe how it can be implemented using a stack. **CO5:** calculate computational efficiency of the principal algorithms for sorting, searching, and hashing.
5.	**3-5-111**	**Database Management Systems**	After completing this course satisfactorily, a student will be able to: **CO1:** Understand the fundamental elements of relational database management systems. **CO2:** Gain knowledge concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL. **CO3:** Design ER-models to represent simple database application scenarios. **CO4:** Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data. **CO5:** apply normalization in database design.
6.	**3-5-112**	**Software Engineering**	After completing this course satisfactorily, a student will be able to: **CO1:** Gain knowledge on software engineering principles and techniques. **CO2:** Develop, maintain and evaluate large-scale software systems. **CO3:** Produce efficient, reliable, robust and cost-effective software solutions. **CO4:** Ability to work as an effective member or leader of software engineering teams. **C5:** Understand and meet ethical standards and legal responsibilities.
7.	**3-6-107B**	**Computer Networks**	After completing this course satisfactorily, a student will be able to: **CO1:** Independently understand basic computer network technology. **CO2:** Identify the different types of network topologies and protocols. **CO3:** Explain the types of transmission media with real time applications **CO4:** Gain knowledge on the functions of all layers and their protocols.

			CO5: Understand the routing protocols and analyze how to assign the IP addresses for the given network.
8.	**3-6-107B2**	**Cloud Computing**	After completing this course satisfactorily, a student will be able to: **CO1:** Compare the strengths and limitations of cloud computing. **CO2:** Identify the architecture, infrastructure and delivery models of cloud computing. **CO3:** Apply suitable virtualization concepts. **CO4:** Choose the appropriate cloud player, Programming Models and approach. **CO5:** Address the core issues of cloud computing such as security, privacy and interoperability.
9.	**3-6-107B1**	**Distributed Systems**	After completing this course satisfactorily, a student will be able to: **CO1:** Demonstrate knowledge of the basic elements and concepts related to distributed system technologies and architectural aspects of distributed systems; **CO2:** Understand various distributed algorithms, such as logical clocks and leader election. **CO3:** Design and implement distributed applications; **CO4:** Demonstrate knowledge of details the main underlying components of distributed systems (such as RPC, file systems); **CO5:** Use and apply important methods in distributed systems to support Task Assignment, Load balancing, Migration and threads.