

# CSE BOS

S.No.	Category	Course Code	Course Title	BOS
1	ES	GR14A1009	Computer Programming	CSE
2	ES	GR14A1010	Data Structures	CSE
3	ES	GR14A1011	Computer Programming& Data Structures	CSE
4	ES	GR14A1027	Computer Programming Lab	CSE
5	ES	GR14A1028	Computer Programming& Data Structures Lab	CSE
6	ES	GR14A2062	Mathematical Foundation of Computer Science	CSE
7	ES	GR14A2063	Database Management Systems	CSE
8	ES	GR14A2067	Databases Lab	CSE
9	ES	GR14A2068	Digital Logic Design Lab	CSE
10	ES	GR14A2069	Operating Systems	CSE
11	ES	GR14A2070	Object Oriented Programming through Java	CSE
12	ES	GR14A2071	Formal Languages and Automata Theory	CSE
13	ES	GR14A2072	Object Oriented Programming through Java Lab	CSE
14	ES	GR14A2073	Operating Systems Lab	CSE
15	ES	GR14A2074	Advanced Databases Lab	CSE
16	ES	GR14A3050	Unix and Shell Programming	CSE
17	ES	GR14A3051	Compiler Design	CSE
18	ES	GR14A3052	Computer Networks	CSE
19	ES	GR14A3053	Principles of Programming Languages	CSE
20	ES	GR14A3054	Advanced Java Programming Lab	CSE
21	ES	GR14A3055	Unix Programming and Compiler Design Lab	CSE
22	ES	GR14A3057	Software Engineering	CSE
23	ES	GR14A3058	Information Security	CSE
24	ES	GR14A3059	Web Technologies	CSE
25	ES	GR14A3062	Multicore Computing and Architecture	CSE
26	ES	GR14A3063	Web Technologies Lab	CSE
27	ES	GR14A3065	Object Oriented Analysis and Design	CSE
28	ES	GR14A3097	Datastructures through C++	CSE
29	ES	GR14A4077	Software Testing Methodologies	CSE

# CSE BOS

30	ES	GR14A4078	Mobile Computing and Applications	CSE
31	ES	GR14A4079	Cloud Computing	CSE
32	ES	GR14A4080	Natural Language Processing	CSE
33	ES	GR14A4081	Machine Learning	CSE
34	ES	GR14A4082	Mobile Application Development	CSE
35	ES	GR14A4083	Advanced Network Programming Lab	CSE
36	ES	GR14A4084	Scripting Languages Lab	CSE
37	ES	GR14A4085	Object Oriented Analysis and Design Lab	CSE
38	ES	GR14A4086	Real Time Operating Systems	CSE
39	ES	GR14A4087	Business Intelligence	CSE
40	ES	GR14A4088	Fundamentals of Image Processing	CSE
41	ES	GR14A4089	Cyber Security	CSE
42	ES	GR14A4090	Design Patterns	CSE
43	ES	GR14A4091	E-Commerce	CSE
44	ES	GR14A4092	Datawarehousing and Datamining Lab	CSE

## 1. Computer Programming

**Course Code: GR14A1009**

**Course Outcomes:** At the end of this course student will be able to

1. Comprehend the basic concepts of computers, software, hardware, generations of programming languages, program development steps, algorithms, flowcharts.
2. Comprehend the pre-programming C-concepts such as C-Tokens like keywords, data-types.
3. Comprehend the concepts of operators, evaluation of expressions, I/O statements.
4. Analyze the concepts of decision making such as branching, looping, unconditional jumping.
5. Comprehend the C-language features such as arrays, strings, functions, pointers, structures, files.
6. Design and develop C-Programs for various general problems and their implementation.
7. Design and develop C-Programs for Complex problems independently

# CSE BOS

## 2. Data Structures

**Course Code: GR14A1010**

**Course Outcomes:** At the end of this course student will be able to

1. Classify and infer various data structures.
2. Demonstrate operations like insert, delete, search and display of various data structures.
3. Exemplify and experiment applications of various data structures.
4. List applications of data structures in real time environments.
5. Compare and contrast static and dynamic data structure implementations.
6. Demonstrate different methods of traversing trees and construct trees from traversals.
7. Implement searching and sorting techniques and analyze their performance.

## 3. Computer Programming & Data Structures

**Course Code: GR14A1011**

**Course Outcomes:** At the end of this course student will be able to

1. Schematize the basic concepts of computers, algorithms and flowcharts.
2. Comprehend the pre programming c concepts like tokens and operators.
3. Analyze the concepts of decision making, looping and unconditional statements.
4. Generalize and develop C programs using the features such as arrays, strings and pointers.
5. Integrate functions of C library to develop programs for real time applications.
6. Create a structure for various general problems and demonstrate file operations.
7. Implement concepts of searching, sorting techniques and basic operations of stacks and queues.

## 4. Computer Programming Lab

**Course Code: GR14A1027**

**Course Outcomes:** At the end of this course student will be able to

1. Analyze and debug a given program
2. Use basic concepts, decision making and looping and c library functions for program development.
3. Develop programs using arrays and strings.
4. Illustrate recursive and non recursive programming approaches.

# CSE BOS

5. Apply concepts of pointers and dynamic memory allocation for program development.
6. Apply fundamental, derived or user defined data types for problem solving.
7. Experiment files operations and demonstrates command line arguments.

## 5. Computer Programming & Data Structures Lab

**Course Code: GR14A1028**

**Course Outcomes:** At the end of this course student will be able to

1. Analyze and debug a given program
2. Use basic concepts, decision making and looping and c library functions for program development.
3. Develop programs using arrays and strings.
4. Illustrate recursive and non recursive programming approaches.
5. Apply concepts of pointers and structures for program development.
6. Experiment files operations and demonstrate command line arguments.
7. Experiment searching and sorting techniques and demonstrate stacks and queues operations

## 6. Mathematical Foundation of Computer Science

**Course Code: GR14A2062**

**Course Outcomes:**

1. Apply mathematical and predicate logic for various applications in computer science
2. Formulate and solve recurrence relations
3. Solving mathematical as well as graphical problems in systematic and logical manner
4. Solve problems involving sets, functions, relations, graphs and trees, boolean algebra.
5. Familiar in calculating number of possible outcomes of elementary combinatorial processes such as permutations and combinations.
6. Apply discrete structures in computer science for various applications.
7. Understand definitions and proofs using basic discrete mathematics.

## 7. Database Management Systems

**Course Code: GR14A2063**

# CSE BOS

## Course Outcomes:

1. Recognize the different application of Databases
2. Generate relational model i.e., tables based on the conceptual ER models.
3. Produce the database schema from relational model.
4. Execute database language for e.g. SQL to manipulate the data in the database.
5. Implement normalization techniques on the created database.
6. Compare the different transactions control mechanisms.
7. Organize file organizations and indexing mechanisms for real time applications.

## 8. Databases Lab

**Course Code: GR14A2067**

### Course Outcomes:

1. Check different database schemas for any given problem.
2. Generate queries on a data base using SQL commands.
3. Implement SQL functions on the retrieved query results.
4. Develop indexes for better query performance.
5. Use the views to provide data security.
6. Recognize appropriate aggregate operators to provide grouping of data.
7. Exemplify DCL commands to provide security to the data base

## 9. Digital Logic Design Lab

**Course Code: GR14A2068**

### Course Outcomes:

1. Identify the logic gates to solve the real world problems.
2. Validate and check the various combinational circuits like adders, comparators, multiplexers and checkers.
3. Verify various sequential circuits like flip flops, registers, counters.
4. Translate the Boolean expressions using hardware description language.
5. Implement the sequential and combinational circuits over hardware description language.
6. Analyze and synthesize logic circuits.
7. Design any Boolean function using universal gates such as NAND and NOR.

## 10. Operating Systems

**Course Code: GR14A2069**

### Course Outcomes:

# CSE BOS

1. Describe functions ,structures of operating systems
2. Comprehend various process management concepts including scheduling, synchronization, deadlocks
3. Learn the concepts of memory management including virtual memory.
4. Solve issues related to file system interface and implementation disk management.
5. Recognize protection and security mechanisms and familiar with various types of operating systems including UNIX.
6. Analyze the sharing of system resources among the users.
7. Differentiate various types of operating systems.

## **11. Object Oriented Programming through Java**

**Course Code: GR14A2070**

**Course Outcomes:**

1. Distinguish between higher threading and multi threading
2. Differentiate between procedure oriented programming and object oriented programming.
3. Apply object oriented programming features and concepts for solving a given problem.
4. Use java standard API library to write complex programs.
5. Implement object oriented programming concepts using java
6. Find the errors and trace the output of the program.
7. Develop interactive programs using applets and swings.

## **12. Formal Languages and Automata Theory**

**Course Code: GR14A2071**

**Course Outcomes:**

1. Recall regular languages and finite automata
2. Recall broad overview of the theoretical foundations of computer science
3. Acquire a fundamental understanding of the core concepts in automata theory and formal languages.
4. Design grammars and automata(recognizers) for different language classes
5. Organize formal language classes and prove language membership properties
6. Compare theorems establishing key properties of formal languages and automata
7. Check computational models including ( but not limited to) decidability and intractability

## **13. Object Oriented Programming through Java Lab**

# CSE BOS

## Course Code: GR14A2072

### Course Outcomes:

1. Differentiate between procedure oriented programming and object oriented programming
2. Implement object oriented programming features and concepts for solving given problem
3. Produce complex programs using Java standard API Library
4. Evaluate the quality of program and improve it
5. Recognize required validations in the internet programming
6. Check for errors and do needed corrections of the program
7. Generate interactive programs using applets and swings.

## 14. Operating Systems Lab

### Course Code: GR14A2072

#### Course Outcomes:

1. Evaluate the performance of different types of CPU scheduling algorithms.
2. Compare different page replacement policies.
3. Compare the types of fragmentations that results with different paging techniques of memory management.
4. Implement algorithms for disk scheduling techniques and evaluate their performance.
5. Implement file organization techniques.
6. Recognize need of Banker's algorithm for deadlock avoidance.
7. Critique the use of semaphores for producer-consumer, readers'-writers' problem, Dining Philosophers problems

## 15. Advanced Databases Lab

### Course Code: GR14A2074

#### Course Outcomes:

1. Implement a programming logic for a relational database
2. Develop a trigger for the table and database
3. Check the applications of procedure and functions
4. Organize tables in to packages
5. Distinguish stored procedures and application procedures
6. Summarize the purpose of PL/SQL Named blocks
7. Evaluate run time errors using the concept of exception handling

# CSE BOS

## 16. Unix and Shell Programming

**Course Code: GR14A3050**

### **Course Outcomes:**

1. Recognize the functionality of UNIX Operating System Utilities and commands.
2. Exemplify shell programs in the UNIX environment while exploring OS features.
3. Develop C programs using Unix Commands.
4. Implement awk scripts in UNIX environment.
5. Differentiate various methods for Inter Process Communication in UNIX.
6. Evaluate the performance of visual and screen editors.
7. Generate applications based on UNIX Operating System functionalities.

## 17. Compiler Design

**Course Code: GR14A2072**

### **Course Outcomes:**

1. Infer the basic concept of compiler design
2. Classify different phases and passes of Compiler.
3. Differentiate the process of Parsing types i.e. Top-down and Bottom-up parser.
4. Implement semantic rules into a parser that performs attribution while parsing.
5. Check different error detection and correction methods
6. Design principles in the construction of software systems of varying complexity.
7. Generate a compiler for a concise programming language.

## 18. Computer Networks

**Course Code: GR14A3052**

### **Course Outcomes:**

1. Recognize different types of network topologies.
2. Explain connecting components used for different layers in Network model.
3. Summarize various kinds of transmission media used in wired networks and wireless networks for communication.
4. Critique different routing technologies involved in Unicasting and Broadcasting networks.

# CSE BOS

5. Compare the performance of Internet Protocol (IP), Transport Control Protocol (TCP) and User Datagram Protocol used (UDP) in Internet.
6. Analyze and use appropriate network protocols in real time applications for efficiency.
7. Produce security algorithms in different networks for protection.

## 19. Principles of Programming Languages

**Course Code: GR14A3053**

### Course Outcomes:

1. Recognize the criteria for evaluating programming languages and language constructs including programming paradigms
2. Exemplify formal methods of syntax.
3. Implement dividing a program into sub-programs in order to increase the readability and reusability.
4. Critique application of logic programming language and functional programming language.
5. Examine abstract data types, concurrency.
6. Compare functional and imperative languages.
7. Illustrate how to handle the exceptions.

## 20. Advanced Java Programming Lab

**Course Code: GR14A3054**

### Course Outcomes:

1. Critique solutions for a range of problems using object-oriented programming.
2. Design and implement simple GUI applications
3. Implement advanced java programming concepts
4. Recognize complex data objects as whole entities, rather than by twiddling with their elements
5. Generate self-explanatory program solving mechanisms.
6. Exemplify programs with networking and multithreading concepts
7. Recall the concepts of basic java language

## 21. Unix Programming and Compiler Design Lab

**Course Code: GR14A3055**

### Course Outcomes:

# CSE BOS

1. Implement the functionality of UNIX utilities and system calls in SHELL environment.
2. Attribute Inter Process Communication to pipes and FIFOs.
3. Develop and validate C programs in UNIX environment for system administration and various kinds of applications.
4. Interpret and define the role of lexical analyzer and use of regular expressions.
5. Check programs for implementing parsing techniques.
6. Explain the working of lex and yacc compiler
7. Implement SHELL programs in UNIX environment.

## 22. Software Engineering

**Course Code: GR14A3057**

### Course Outcomes:

1. Plan to solve engineering problems.
2. Recognize the professional and ethical responsibility.
3. Implement the schedule of software development.
4. Attribute the impact of engineering solutions to global, economic, environmental, and societal context.
5. Compare different life cycle models.
6. Critique based on cyclomatic complexity of different software being developed.
7. Design and maintain software systems.

## 23. Information Security

**Course Code: GR14A3053**

### Course Outcomes:

1. Implement the applications defined with confidentiality, integrity, and authentication.
2. Interpret various cryptographic algorithms.
3. Summarize intrusion and intrusion detection, Web security and firewalls.
4. Compare various message authentication algorithms.
5. Recognize the threats to information security
6. Differentiate the Key Management techniques
7. Critique the issues with structure of Authentication Service and Electronic Mail Security

## 24. Web Technologies

**Course Code: GR14A3059**

# CSE BOS

## Course Outcomes:

1. Recall html, JavaScript, CSS and applet codes.
2. Implement hierarchy of objects in HTML and XML.
3. Design dynamic and interactive web pages by embedding Java Script code in HTML.
4. Design dynamic and interactive websites.
5. Critique different technologies used for WEB designing
6. Analyze and create XML documents and XML Schema
7. Analyze and build interactive web applications using ASP and ASP.NET

## 25. Multicore Computing and Architecture

### Course Code: GR14A3062

#### Course Outcomes:

1. Classify multicore architectures
2. Distinguish between higher threading and multi-threading
3. Implement SIMD techniques for data driven real time applications
4. Implement Programming skills of OMP for scientific problems
5. Recall MPI concepts while dealing with parallel problems
6. Analyze Scheduling in multi-threaded environment
7. Check load balancing in multi core environment

## 26. Web Technologies Lab

### Course Code: GR14A3063

#### Course Outcomes:

1. Generate Java Applications.
2. Recall programming skills on internet based applications.
3. Design and develop sophisticated web sites and applications.
4. Compare web projects developed with traditional projects
5. Critique procedures of internet programming
6. Implement the important HTML tags for designing static pages and separate design from content using Cascading Style sheet.
7. Compare the use web application development software tools i.e. Ajax, PHP and XML etc.

## 27. Object Oriented Analysis and Design

### Course Code: GR14A3065

#### Course Outcomes:

1. Exemplify the interface between classes and objects

# CSE BOS

2. Create class diagrams that model both the domain model and design model of a software system
3. Create interaction diagrams that model the dynamic aspects of a software system.
4. Critique all the nine UML diagrams drawn for a software design
5. Recognize business classes, attributes and relationships and construct the domain model as a class diagram using Rational Rose.
6. Check Component and Deployment diagrams for Real time Systems
7. Produce Forward and reverse engineering design for all UML Diagrams.

## 28. Data structures through C++

**Course Code: GR14A3097**

### Course Outcomes:

1. Choose appropriate data structures as applied to specified problem definition.
2. Implement operations like searching, insertion, deletion and traversing.
3. Critique dynamic and static data structures implementations
4. Able to use linear and non-linear data structures like stacks, queues, linked list etc.
5. Differentiate among methods for traversing
6. Check various data structures performance.
7. Produce applications in other domains using Data Structures.

## 29. Software Testing Methodologies

**Course Code: GR14A4077**

### Course Outcomes:

1. Create a model for testing and criticize various consequences of bugs.
2. Interpret sensitization and instrumentation of paths
3. Apply a path testing technique for a given software.
4. Check various state testing techniques for exploring state related bugs.
5. Recognize domains for data items used in an application.
6. Design test cases based on decision tables.
7. Attribute graph matrices techniques for the simplification of testing process.

## 30. Mobile Computing and Applications

**Course Code: GR14A4078**

### Course Outcomes:

1. Explain the concepts and features of mobile computing.

# CSE BOS

2. Recognize the important issues of developing mobile computing systems and applications.
3. Summarize the underlying technologies using in mobile computing.
4. Critique the working of the underlying mobile communication networks, their technical features, and kinds of applications they can support.
5. Produce a solution with appropriate technology and tools for mobile applications.
6. Check developed mobile application.
7. Compare and define the different architectures and applications of mobile computing in real time.

## 31. Cloud Computing

**Course Code: GR14A4079**

### **Course Outcomes:**

1. Understand the features, advantages and challenges of Cloud Computing, compare their operation, implementation and performance.
2. Understand, Analyze and Compare different types of Clouds and Cloud Services.
3. Execute/Provide Cloud computing solutions for individual users as well as enterprises.
4. Evaluate, Collaborate and work in teams to contribute and give feedback on case studies on different cloud computing solutions.
5. Understanding and Validating the financial, and technological implications in selecting Cloud Computing Paradigm for an organization.
6. Understand and Analyze the Challenges and Risks involved in the Cloud.
7. Create/Deploying of an Application on a Cloud

## 32. Natural Language Processing

**Course Code: GR14A4080**

### **Course Outcomes:**

1. Summarize linguistic phenomena and an ability to model them with formal grammars
2. Check proper experimental methodology for training and evaluating empirical NLP systems
3. Create statistical models over strings and trees
4. Design, implement, and analyze NLP algorithms
5. Compare the work done in different research papers of natural language processing domain.

# CSE BOS

6. Differentiate parameters used for supervised and unsupervised training methods
7. Recognize the role of machine learning and language models.

## 33. Machine Learning

**Course Code: GR14A4081**

### **Course Outcomes:**

1. Analyse data operations on variety of databases.
2. Apply predictive data analytic methods.
3. Implement the Fit statistical models on machine learning.
4. Critique the results to produce business intelligence.
5. Analyze trends in analytical data using data mining, segmentation and decision trees.
6. Exemplify data analytic tools.
7. Implement appropriate tools for data visualization.

## 34. Mobile Application Development

**Course Code: GR14A4082**

### **Course Outcomes:**

1. Recall the key technological principles and methods for delivering and maintaining mobile applications,
2. Evaluate suitable software tools and APIs for the development of a particular mobile application
3. Implement High level and Low level Displays of mobile and Storing data by using Record Management System(RMS)
4. Produce mobile applications using an appropriate software development environment with Database.
5. Critique requirements for mobile platforms to establish appropriate strategies for development and deployment
6. Interpret a scenario, plan, design and develop a prototype hybrid and native mobile application,
7. Differentiate leading edge developments in mobile application development.

## 35. Advanced Network Programming Lab

**Course Code: GR14A4083**

### **Course Outcomes:**

1. Implement client server applications in the UNIX environment while exploring OS features.

# CSE BOS

2. Exemplify inter-process communications using semaphores, shared memory, message queues.
3. Develop TCP Client Server applications..
4. Develop UDP Client server applications
5. Differentiate CONNECTION ORIENTED and CONNECTIONLESS communication between client server
6. Generate Socket Programming in Linux environment
7. Implement the peer to peer communication in Linux Platform

## 36. Scripting Languages Lab

**Course Code: GR14A4084**

### Course Outcomes:

1. Recall process of executing a PHP-based script on a webserver.
2. Compare different Data Base languages.
3. Generate complete web applications using PHP and MySQL.
4. Analyze requirements of software system for the purpose of implementing in PERL/PYTHON.
5. Implement simple graphical user interfaces that drive their programs.
6. Critique the paradigm for dealing with form-based data, both from the syntax of HTML forms, and how they are accessed inside a PHP-based script.
7. Organize websites to load data from them (web scraping).

## 37. Object Oriented Analysis and Design Lab

**Course Code: GR14A4085**

### Course Outcomes:

1. Recall the fundamental principle of object oriented programming.
2. Compare the design based on the different diagrams drawn to find any missing requirements.
3. Implement UML diagrams for Library management system.
4. Organize different diagrams into packages.
5. Critique the applications developed for Railway reservation system and ATM.
6. Generate USE CASE diagrams for different applications
7. Produce multiple design artifacts for projects.

## 38. Real Time Operating Systems

**Course Code: GR14A4086**

### Course Outcomes:

# CSE BOS

1. Generate embedded system applications.
2. Compare the solutions for deadlocks.
3. Check applying of divisible load theory and fault tolerance in RTOS.
4. Explain real time concepts such as pre-emptive multitasking, task priorities etc.,
5. Apply formal methods to the analysis and design of real time systems.
6. Implement real time operating system kernel.
7. Summarize the time management of the real time operating system.

## 39. Business Intelligence

**Course Code: GR14A4087**

### **Course Outcomes:**

1. Appraise and apply evidence practice (EBP) to formulate effective solutions to deal with contemporary performance problems and issues associated with the delivery of business information systems.
2. Create a consultant report that critically evaluates important design principles and operations involving business intelligence and that offers effective recommendations aimed at enhancing business outcomes.
3. Devise a framework to assess company/industry performance to apply it to produce a performance report of a nominated entity.
4. Exemplify the concepts and architectures of data warehousing
5. Evaluate the importance and implementation of learning theory to construct and apply practices that facilitate aspects of personal and institutional change.
6. Summarize the impact of business reporting, information visualization and dash boards.
7. Demonstrate competence in oral, written and visual communication in business reports and presentations.

## 40. Fundamentals of Image Processing

**Course Code: GR14A4088**

### **Course Outcomes:**

1. Implement 2D,3D image representations
2. Apply image transformations for smoothing and enhancements
3. Recall neighborhood operators for images
4. Check Discrete Wavelet Transforms for image compression
5. Implement mathematical transformations such as scaling rotation etc..
6. Check image transformation techniques using MAT LAB.
7. Design projects on object recognition

## 41. Cyber Security

# CSE BOS

## Course Code: GR14A4089

### Course Outcomes:

1. Attribute different types of cyber criminals and the motives behind them.
2. Infer different types of cyber-attacks and steps involved in planning Cybercrime.
3. Exemplifying the security challenges faced by the mobile workforce and their implications.
4. Differentiate various tools and methods used in Cybercrime.
5. Recall, implement and follow the cyber law.
6. Classifying different methods of phishing and identity theft.
7. Plan for the digital forensic tools.

## 42. Design Patterns

### Course Code: GR14A4090

#### Course Outcomes:

1. Apply Singleton Pattern to provide controlled access to the sole instance of a class.
2. Apply Composite Pattern to represent whole-part hierarchies of objects.
3. Explain Factory Method Pattern to eliminate the need to 'hard-code' specific class names.
4. Attribute Strategy Pattern to configure a class with one of many alternate behaviour
5. Produce creational patterns to help make systems independent of how its objects are created.
6. Plan structural patterns to compose classes and objects into larger structures.
7. Critique other behavioural pattern to manage algorithms and assign responsibilities to objects

## 43. E-Commerce

### Course Code: GR14A4091

#### Course Outcomes:

1. Summarize nature and types of e-commerce.
2. Differentiate all types of business models.
3. Attribute the appropriate technologies to develop and deliver e-commerce applications.
4. Plan suitable software, hardware and e-com tools for developing a better web application.
5. Implement a robust, safe and secured online payment system.

# CSE BOS

6. Recognize online content and management.
7. Interpret about the current e-commerce development and usage of effective internet.

## **44. Data ware housing and Data mining Lab**

**Course Code: GR14A4092**

### **Course Outcomes:**

1. Recall basic concepts and applications of data warehouse and data mining.
2. Implement various data mining techniques using Weka tool
3. Implement data mining methods for classification.
4. Check recent trends in data mining such as web mining, spatial-temporal mining.
5. Generate new methods for clustering data.
6. Evaluate Apriori algorithms for Association Rule Mining.
7. Evaluate FP growth algorithms for Association Rule Mining.