



HKBK College of Engineering
Department of Information Science and Engineering

CO BOOKLET – 2021 Scheme – 3rd semester to 8th semester

Course Name/Code: DATA STRUCTURES AND APPLICATIONS/21CS32 Semester of Study III

C2 32.1	Identify different data structures and their applications
C2 32.2	Apply stack and queues in solving problems
C2 32.3	Demonstrate applications of linked list
C2 32.4	Explore the applications of trees and graphs to model and solve the real-world problem.
C2 32.5	Make use of Hashing techniques and resolve collisions during mapping of key value pairs

Course Name/Code: ANALOG AND DIGITAL ELECTRONICS/21CS33 Semester of Study III

C2 33.1	Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp
C2 33.2	Explain the basic principles of A/D and D/A conversion circuits and develop the same
C2 33.3	Simplify digital circuits using Karnaugh Map, and Quine-McClusky Methods
C2 33.4	Explain Gates and flipflops and make us in designing different data processing circuits, registers and counters and compare the types
C2 33.5	Develop simple HDL programs

Course Name/Code: COMPUTER ORGANIZATION/21CS34 Semester of Study III

C2 34.1	Explain the organization and architecture of computer systems with machine instructions and programs.
C2 34.2	Analyze the input/output devices communicating with computer system
C2 34.3	Demonstrate the functions of different types of memory devices.
C2 34.4	Apply different data types on simple arithmetic and logical unit
C2 34.5	Analyze the functions of basic processing unit, Parallel processing and pipelining

Course Name/Code: OBJECT ORIENTED PROGRAMMING WITH JAVA LABORATORY/21CS35 Semester of Study III

C2 35.1	Use Eclipse/NetBeans IDE to design, develop, debug Java Projects.
C2 35.2	Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP.
C2 35.3	Demonstrate the ability to design and develop java programs, analyze, and interpret objectoriented data and document results.
C2 35.4	Apply the concepts of multiprogramming, exception/event handling, abstraction to develop robust programs
C2 35.5	Develop user friendly applications using File I/O and GUI concepts.

Course Name/Code: MASTERING OFFICE /21CSL381 Semester of Study III

C2 381.1	Know the basics of computers and prepare documents, spreadsheets, make small presentations with audio, video and graphs and would be acquainted with internet
C2 381.2	Create, edit, save and print documents with list tables, header, footer, graphic, spellchecker, mail merge and grammar checker
C2 381.3	Attain the knowledge about spreadsheet with formula, macros spell checker etc
C2 381.4	Demonstrate the ability to apply application software in an office environment
C2 381.5	Use Google Suite for office data management tasks

Course Name/Code: C++ PROGRAMMING /21CS382	Semester of Study IV
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C2 382.1	Able to understand and design the solution to a problem using object-oriented programming concepts
C2 382.2	Able to reuse the code with extensible Class types, User-defined operators and function Overloading
C2 382.3	Achieve code reusability and extensibility by means of Inheritance and Polymorphism
C2 382.4	Identify and explore the Performance analysis of I/O Streams
C2 382.5	Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems

Course Name/Code: DESIGN AND ANALYSIS OF ALGORITHMS/ 21CS42	Semester of Study IV
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C2 42.1	Analyze the performance of the algorithms, state the efficiency using asymptotic notations and analyze mathematically the complexity of the algorithm
C2 42.2	Apply divide and conquer approaches and decrease and conquer approaches in solving the problems analyze the same
C2 42.3	Apply the appropriate algorithmic design technique like greedy method, transform and conquer approaches and compare the efficiency of algorithms to solve the given problem
C2 42.4	Apply and analyze dynamic programming approaches to solve some problems. and improve an algorithm time efficiency by sacrificing space
C2 42.5	Apply and analyze backtracking, branch and bound methods and to describe P, NP and NP Complete problems

Course Name/Code: MICROCONTROLLER AND EMBEDDED SYSTEMS/21CS43	Semester of Study IV
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C2 44.1	Explain C-Compilers and optimization
C2 44.2	Describe the ARM microcontroller's architectural features and program module
C2 44.3	Apply the knowledge gained from programming on ARM to different applications
C2 44.4	Program the basic hardware components and their application selection method
C2 44.5	Demonstrate the need for a real-time operating system for embedded system applications

Course Name/Code: OPERATING SYSTEMS /21CS44	Semester of Study IV
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C2 44.1	Identify the structure of an operating system and its scheduling mechanism
C2 44.2	Demonstrate the allocation of resources for a process using scheduling algorithm
C2 44.3	Identify root causes of deadlock and provide the solution for deadlock elimination
C2 44.4	Explore about the storage structures and learn about the Linux Operating system.
C2 44.5	Analyze Storage Structures and Implement Customized Case study

Course Name/Code: PYTHON PROGRAMMING LABORATORY / 21CSL46	Semester of Study IV
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C2 46.1	Demonstrate proficiency in handling of loops and creation of functions
C2 46.2	Identify the methods to create and manipulate lists, tuples and dictionaries
C2 46.3	Discover the commonly used operations involving regular expressions and file system
C2 46.4	Interpret the concepts of Object-Oriented Programming as used in Python
C2 46.5	Determine the need for scraping websites and working with PDF, JSON and other file formats

Course Name/Code: WEB PROGRAMMING / 21CSL481	Semester of Study IV
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C2 481.1	Describe the fundamentals of web and concept of HTML
C2 481.2	Use the concepts of HTML, XHTML to construct the web pages
C2 481.3	Interpret CSS for dynamic documents
C2 481.4	Evaluate different concepts of JavaScript & Construct dynamic documents
C2 481.5	Design a small project with JavaScript and XHTML

Course Name/Code: UNIX SHELL PROGRAMMING / 21CS482	Semester of Study IV
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C2 482.1	Know the basics of Unix concepts and commands
C2 482.2	Evaluate the UNIX file system
C2 482.3	Apply Changes in file system
C2 482.4	Understand scripts and programs
C2 482.5	Analyze Facility with UNIX system process

Course Name/Code: R PROGRAMMING / 21CSL483	Semester of Study IV
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C2 483.1	To understand the fundamental syntax of R through readings, practice exercises
C2 483.2	To demonstrations, and writing R code
C2 483.3	To apply critical programming language concepts such as data types, iteration
C2 483.4	To import a variety of data formats into R using R-Studio
C2 483.5	To prepare or tidy data for in preparation for analyze

Course Name/Code: AUTOMATA THEORY AND COMPILER DESIGN/21CS51	Semester of Study V
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C3 51.1	Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation
C3 51.2	Design and develop lexical analyzers, parsers and code generators
C3 51.3	Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers
C3 51.4	Acquire fundamental understanding of the structure of a Compiler and Apply concepts automata theory and Theory of Computation to design Compilers
C3 51.5	Design computations models for problems in Automata theory and adaptation of such model in the field of compilers

Course Name/Code: COMPUTER NETWORKS /21CS52	Semester of Study V
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C3 52.1	Learn the basic needs of communication system.
C3 52.2	Interpret the communication challenges and its solution
C3 52.3	Identify and organize the communication system network components
C3 52.4	Design communication networks for user requirements

Course Name/Code: DATABASE MANAGEMENT SYSTEMS /21CS53	Semester of Study V
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C3 53.1	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
C3 53.2	Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation.
C3 53.3	Design and build simple database systems and relate the concept of transaction, concurrency control and recovery in database
C3 53.4	Develop application to interact with databases, relational algebra expression
C3 53.5	Develop applications using tuple and domain relation expression from queries

Course Name/Code: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING / 21CS54	Semester of Study V
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C3 54.1	Apply the knowledge of searching and reasoning techniques for different applications
C3 54.2	Have a good understanding of machine learning in relation to other fields and fundamental issues and challenges of machine learning
C3 54.3	Apply the knowledge of classification algorithms on various dataset and compare results
C3 54.4	Model the neuron and Neural Network, and to analyze ANN learning and its applications
C3 54.5	Identifying the suitable clustering algorithm for different pattern

Course Name/Code: DATABASE MANAGEMENT SYSTEMS LABORATORY WITH MINI PROJECT / 21CSL55	Semester of Study V
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C3 55.1	Create, Update and query on the database
C3 55.2	Demonstrate the working of different concepts of DBMS
C3 55.3	Implement, analyze and evaluate the project developed for an application

Course Name/Code: ANGULAR JS AND NODE JS / 21CSL581	Semester of Study V
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C3 581.1	Describe the features of Angular JS
C3 581.2	Recognize the form validations and controls
C3 581.3	Implement Directives and Controllers
C3 581.4	Evaluate and create database for simple application
C3 581.5	Plan and build webservers with node using Node .JS

Course Name/Code: C# AND .NET FRAMEWORK/ 21CS582	Semester of Study V
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C3 582.1	Able to explain how C# fits into the .NET platform
C3 582.2	Describe the utilization of variables and constants of C#
C3 582.3	Use the implementation of object-oriented aspects in applications
C3 582.4	Analyze and Set up Environment of .NET Core
C3 582.5	Evaluate and create a simple project application

Course Name/Code: SOFTWARE ENGINEERING & PROJECT MANAGEMENT / 21CS61	Semester of Study VI
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C3 61.1	Understand the activities involved in software engineering and analyze the role of various process models
C3 61.2	Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques
C3 61.3	Describe various software testing methods and to understand the importance of agile methodology and DevOps
C3 61.4	Illustrate the role of project planning and quality management in software development
C3 61.5	Understand the importance of activity planning and different planning models

Course Name/Code: FULLSTACK DEVELOPMENT / 21CS62	Semester of Study VI
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C3 62.1	Understand the working of MVT based full stack web development with Django
C3 62.2	Designing of Models and Forms for rapid development of web pages
C3 62.3	Analyze the role of Template Inheritance and Generic views for developing full stack web applications
C3 62.4	Apply the Django framework libraries to render nonHTML contents like CSV and PDF
C3 62.5	Perform jQuery based AJAX integration to Django Apps to build responsive full stack web applications

Course Name/Code: SOFTWARE TESTING / 21IS63	Semester of Study VI
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C3 63.1	Explain the significance of software testing and quality assurance in software development
C3 63.2	Apply the concepts of software testing to assess the most appropriate testing method
C3 63.3	Analyze the importance of testing in software development
C3 63.4	Evaluate the suitable testing model to derive test cases for any given software
C3 63.5	Develop appropriate document for the software artefact

Course Name/Code: AGILE TECHNOLOGIES / 21CS641	Semester of Study VI
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C3 641.1	Understand the fundamentals of agile technologies
C3 641.2	Explain XP Lifecycle, XP Concepts and Adopting XP
C3 641.3	Apply different techniques on Practicing XP, Collaborating and Releasing
C3641.4	Analyze the Values and Principles of Mastering Agility
C3641.5	Demonstrate the agility to deliver good values

Course Name/Code: ADVANCED JAVA PROGRAMMING /21CS642	Semester of Study VI
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C3 642.1	Understanding the fundamental concepts of Enumerations and Annotations
C3 642.2	Apply the concepts of Generic classes in Java programs
C3 642.3	Demonstrate the concepts of String operations in Java
C3 642.4	Develop web based applications using Java servlets and JSP
C3 642.5	Illustrate database interaction and transaction processing in Java

Course Name/Code: DATA MINING AND DATA WAREHOUSING / 21IS643	Semester of Study VI
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C3 643.1	Understand warehousing architectures and tools for systematically organizing large database and use their data to make strategic decisions
C3 643.2	Apply KDD process for finding interesting pattern from warehouse
C3 643.3	Analyze the kinds of patterns that can be discovered by association rule mining
C3 643.4	Evaluate interesting patterns from large amounts of data to analyze for predictions and classification
C3 643.5	Design select suitable methods for data mining and analysis

Course Name/Code: DATA SCIENCE AND VISUALIZATION/ 21CS644	Semester of Study VI
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C3 644.1	Understand the data in different forms
C3 644.2	Apply different techniques to Explore Data Analysis and the Data Science Process
C3 644.3	Analyze feature selection algorithms & design a recommender system
C3 644.4	Evaluate data visualization tools and libraries and plot graphs
C3 644.5	Analyze performance of android applications and understand the role of permissions and Security

Course Name/Code: INTRODUCTION TO DATA STRUCTURES / 21CS651	Semester of Study VI
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C3 651.1	Express the fundamentals of static and dynamic data structure
C3 651.2	Summarize the various types of data structure with their operations
C3 651.3	Interpret various searching and sorting techniques
C3 651.4	Choose appropriate data structure in problem solving
C3 651.5	Develop all data structures in a high level language for problem solving

Course Name/Code: INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS / 21CS652	Semester of Study VI
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C3 652.1	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
C3 652.2	Use Structured Query Language (SQL) for database manipulation
C3 652.3	Design and build simple database systems
C3 652.4	Develop application to interact with databases

Course Name/Code: INTRODUCTION TO CYBER SECURITY / 21CS653	Semester of Study VI
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C3 653.1	Describe the cyber crime terminologies
C3 653.2	Analyze cybercrime in mobiles and wireless devices along with the tools for Cybercrime and prevention
C3 653.3	Analyze the motive and causes for cybercrime, cybercriminals, and investigators
C3 653.4	Apply the methods for understanding criminal case and evidence, detection standing criminal case and evidence

Course Name/Code: PROGRAMMING IN JAVA / 21CS654	Semester of Study VI
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C3 654.1	Develop JAVA programs using OOP principles and proper program structuring
C3 654.2	Develop JAVA program using packages, inheritance and interface
C3 654.3	Develop JAVA programs to implement error handling techniques using exception handling
C3 654.4	Demonstrate string handling concepts using JAVA

Course Name/Code: SOFTWARE TESTING LABORATORY/ 21ISL66	Semester of Study VI
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C3 66.1	List out the requirements for the given problem and develop test cases for any given problem
C3 66.2	Design and implement the solution for given problem and to design flow graph
C3 66.3	Use Eclipse/NetBeans IDE and testing tools to design, develop, debug the Project and create appropriate document for the software artifact
C3 66.4	Use the appropriate functional testing strategies. Compare the different testing techniques
C3 66.5	Classify and Compare the problems according to a suitable testing model applying the test coverage metrics

Course Name/Code: CRYPTOGRAPHY AND NETWORK SECURITY / 21IS71	Semester of Study VII
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C4 71.1	Understand Cryptography, Network Security theories, algorithms and systems
C4 71.2	Apply different Cryptography and Network Security operations on different applications.
C4 71.3	Analyse different methods for authentication and access control
C4 71.4	Evaluate Public and Private key, Key management, distribution and certification
C4 71.5	Design necessary techniques to build protection mechanisms to secure computer networks

Course Name/Code: CLOUD COMPUTING/21CS72	Semester of Study VII
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C4 72.1	Understand and analyze various cloud computing platforms and service provider
C4 72.2	Illustrate various virtualization concepts
C4 72.3	Identify the architecture, infrastructure and delivery models of cloud computing
C4 72.4	Understand the Security aspects of CLOUD
C4 72.5	Define platforms for development of cloud applications

Course Name/Code: OBJECT ORIENTED MODELING AND DESIGN / 21CS731	Semester of Study VII
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C4 731.1	Describe the concepts of object-oriented and basic class modelling
C4 731.2	Draw class diagrams, sequence diagrams and interaction diagrams to solve problems.
C4 731.3	Choose and apply a befitting design pattern for the given problem.

Course Name/Code: DIGITAL IMAGE PROCESSING / 21CS732	Semester of Study VII
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C4 732.1	Understand the fundamentals of Digital Image Processing
C4 732.2	Apply different Image transformation techniques
C4 732.3	Analyze various image restoration techniques
C4 732.4	Understand colour image and morphological processing
C4 732.5	Design image analysis and segmentation techniques

Course Name/Code: USER INTERFACE DESIGN / 21CS733	Semester of Study VII
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C4 733.1	Understand importance and characteristics of user interface design
C4 733.2	Apply user interface design process on business functions
C4 733.3	Demonstrate system menus, navigation schemes and windows characteristics
C4 733.4	Analyze screen based controls and device based controls
C4 733.5	Design the prototypes and test plans of user interface

Course Name/Code: BLOCKCHAIN TECHNOLOGY /21CS734	Semester of Study VII
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C4 734.1	Describe the concepts of Distributed computing and its role in Blockchain
C4 734.2	Describe the concepts of Cryptography and its role in Blockchain
C4 734.3	List the benefits, drawbacks and applications of Blockchain
C4 734.4	Appreciate the technologies involved in Bitcoin
C4 734.5	Appreciate and demonstrate the Ethereum platform to develop blockchain application

Course Name/Code: INTERNET OF THINGS / 21CS735	Semester of Study VII
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C4 735.1	Understand the evolution of IoT, IoT networking components, and addressing strategies in IoT
C4 735.2	Analyze various sensing devices and actuator types
C4 735.3	Demonstrate the processing in IoT
C4 735.4	Apply different connectivity technologies
C4 735.5	Understand the communication technologies , protocols and interoperability in IoT

Course Name/Code: SOFTWARE ARCHITECTURE AND DESIGN PATTERNS/ 21CS741	Semester of Study VII
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C4 741.1	Design and implement codes with higher performance and lower complexity
C4 741.2	Be aware of code qualities needed to keep code flexible
C4 741.3	Experience core design principles and be able to assess the quality of a design with respect to these principles
C4 741.4	Capable of applying these principles in the design of object oriented systems
C4 741.5	Demonstrate an understanding of a range of design patterns. Be capable of comprehending a design presented using this vocabulary
C4 741.6	Be able to select and apply suitable patterns in specific contexts

Course Name/Code: - FILE STRUCTURES /21IS742	Semester of Study VII
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C4 742.1	Understand the fundamental concepts of file processing operations and storage structures
C4 742.2	Apply object orientation concepts to manipulate records
C4 742.3	Apply concepts of sorting and merging on multiple files
C4 742.4	Analyze the sequential and indexing file accessing techniques with appropriate data structures
C4 742.5	Illustrate the usage of hashing techniques to organize file structures

Course Name/Code: - DEEP LEARNING / 21CS743	Semester of Study VII
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C4 743.1	Understand the fundamental issues and challenges of deep learning data, model selection, model complexity etc
C4 743.2	Describe various knowledge on deep learning and algorithms
C4 743.3	Apply CNN and RNN model for real time applications
C4 743.4	Identify various challenges involved in designing and implementing deep learning algorithms
C4 743.5	Relate the deep learning algorithms for the given types of learning tasks in varied domain

Course Name/Code: - ROBOTIC PROCESS AUTOMATION DESIGN AND DEVELOPMENT / 21CS744	Semester of Study VII
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C4 744.1	To Understand the basic concepts of RPA
C4 744.2	To Describe various components and platforms of RPA
C4 744.3	To Describe the different types of variables, control flow and data manipulation techniques
C4 744.4	To Understand various control techniques and OCR in RPA
C4 744.5	To Describe various types and strategies to handle exceptions

Course Name/Code: - NOSQL DATABASE/ 21CS745	Semester of Study VII
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C4 745.1	Demonstrate an understanding of the detailed architecture of Column Oriented NoSQL databases, Document databases, Graph databases
C4 745.2	Use the concepts pertaining to all the types of databases
C4 745.3	Analyze the structural Models of NoSQL
C4 745.4	Develop various applications using NoSQL databases

Course Name/Code: PROGRAMMING IN PYTHON/ 21CS751	Semester of Study VII
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C4 751.1	Understand Python syntax and semantics and be fluent in the use of Python flow control and functions
C4 751.2	Demonstrate proficiency in handling Strings and File Systems
C4 751.3	Represent compound data using Python lists, tuples, Strings, dictionaries
C4 751.4	Read and write data from/to files in Python Programs

Course Name/Code: INTRODUCTION TO AI AND ML / 21CS752	Semester of Study VII
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C4 752.1	Design intelligent agents for solving simple gaming problems
C4 752.2	Have a good understanding of machine learning in relation to other fields and fundamental issues and Challenges of machine learning
C4 752.3	Understand data and applying machine learning algorithms to predict the outputs
C4 752.4	Model the neuron and Neural Network, and to analyze ANN learning and its applications

Course Name/Code: INTRODUCTION TO BIG DATA/ 21CS753	Semester of Study VII
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C4 753.1	Master the concepts of HDFS and MapReduce framework
C4 753.2	Investigate Hadoop related tools for Big Data Analytics and perform basic
C4 753.3	Infer the importance of core data mining techniques for data analytics
C4 753.4	Use Machine Learning algorithms for real world big data

Course Name/Code: INTRODUCTION TO DATA SCIENCE / 21CS754	Semester of Study VII
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C4 754.1	Describe the data science terminologies
C4 754.2	Apply the Data Science process on real time scenario
C4 754.3	Analyze data visualization tools
C4 754.4	Apply Data storage and processing with frameworks