III Semester

Sr No	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Continual Assessment	End Sem Examination	Total
1	AS306T	Applied Mathematics – III	4	-	-	4	30	70	100
2	DS301T	Data Structure	4	-	-	4	30	70	100
3	DS301P	Data Structure Lab	-	-	4	2	25	25	50
4	DS302T	Digital Circuits and Fundamentals of Microprocessor	3	-	-	3	30	70	100
5	DS302P	Digital Circuits and Fundamentals of Microprocessor Lab	-	-	2	1	25	25	50
6	DS303T	Computer Networks	3	-	-	3	30	70	100
7	DS304T	Introduction to Data Science	3	-	-	3	30	70	100
8	DS305P	Computer Lab -I	-	-	2	1	25	25	50
9	H102	Universal Human Values-II	3	-	-	3	30	70	100
10	DS306T	Career Development- I	2	-	-	0	Audit		
Total			**22**	**0**	**8**	**24**	**255**	**495**	**750**

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
AS306T	Applied Mathematics-III	3	1		4	30	70	100

Course Objectives	Course Outcomes
● The course aims to familiarize the students with concepts in linear algebra.	**Students will be able to** ● Use the tool of power series for learning advanced engineering mathematics. ● Identify Engineering problems related to Matrices: Eigen value & Eigen vectors & Functions of Matrices. ● Find the deficiencies in the vector space. ● Apply the concepts of linear operators. ● Find the solution in R2 and R3 and extend these results to higher dimensions.

Unit I **[7Hrs]**

Properties of Infinite series, Positive term series, Cauchy's fundamental test for divergence, p-series, Comparison test, D' Alembert's ratio test, Raabe's test (higher ratio test), Gauss's test.

Unit II **[8Hrs]**

Matrices: Linear dependence of vectors, Characteristics equation, Eigen values and Eigen vectors, Reduction to Diagonal form,
Reduction of Quadratic form to Canonical form by Orthogonal Transformation, Sylvester's Theorem.

Unit III **[6Hrs]**

Vector Space; Subspaces; Linear Dependence/Independence; Basis; Dimension; Linear transformation; Range Space and Rank; Null Space and Nullity; Rank nullity theorem

Unit IV **[7Hrs]**

Matrix Representation of a linear transformation; Linear Operators on Rn and their representation as square matrices Invertible linear operator, Inverse of nonsingular matrices.

Unit V **[7Hrs]**

Inner Product Spaces, Norm; Orthonormal Sets, Gram Schmidt orthogonalization process; projections, positive definite matrices,
and Singular Value Decomposition.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Linear Algebra	Hoffman and Kunze		Prentice Hall of India
2	Linear Algebra And Its Applications	Gilbert Strang		Nelson Engineering
3	First course in Linear Algebra	Nagpaul		Wiley Eastern Ltd.
4	Higher Engineering Mathematics	B.V. Ramana	11th reprint	Tata McGraw Hill

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Linear Algebra	Seymour Lipschutz		Schaum series
2	An introduction to linear algebra	V. Krishnamoorthy		Affiliated East West Press
3	Matrix and Linear Algebra	K.B.Datta		Prentice Hall of India
4	Advanced Engineering Mathematics	Erwin Kreysizig	8th	Wiley India
5	Higher Engineering Mathematics	B.S. Grewal	40th	Khanna Publication

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
DS301T	Data Structures	3	1		4	30	70	100

Course Objectives	Course Outcomes
This course is intended ● To provide knowledge of basic concepts in data structures and algorithms ● To emphasize the application of data structures in developing and implementing efficient programs and algorithms. ● To understand the construct and analysis various data structures and abstract data types.	**Students will be able to** ● understand the basic concept of data structures and time complexity. ● solve programming problems and demonstrate using searching and sorting algorithms using programming language C. ● design and implement solutions for programming problems. ● classify & demonstrate the use of different data structures like stack, queue, linked list, trees & graphs along with related algorithms. ● infer the use of symbol tables for hashing and collision resolution. ● create applications with the usage of different data structures for real life problems.

Unit I **[8Hrs]**

Introduction: - Concept of Data structures, Time and space analysis of algorithms, Big oh and theta notations and omega notations, Average, best and worst case analysis

Searching and sorting techniques- Linear search, Binary search, Indexed search, Insertion sort, selection sort, Bubble Sort, radix Sort, Merge Sort, Quick Sort.

Unit II **[8Hrs]**

Linked Lists : Singly linked list, Implementation of linked list using static and dynamic memory allocation, operations on linked list,
polynomial representations and manipulations are using linked list, circular linked list, doubly linked list, Generalized list, sparse matrix, polynomial

Unit III **[8Hrs]**

Stack and Queue - Array representation of stacks, Implementation of stack using linked lists, Queues ,Dequeue, Circular queue, Polish notation, Application of stack & queue: Conversion from Infix to Postfix ,Evaluation of postfix expressions, Priority Queues

Unit IV **[7Hrs]**

Trees: Basic Terminology, Basic trees, Binary tree representations, threaded storage representation, binary tree traversals, binary search trees, Application of trees. Preliminary treatment of AVL Trees, B- Trees.

Unit V **[9Hrs]**

Graphs: Definition & terminology, Graph representation: matrix representation of Graph, List of structure, other representation of
graphs, Breadth First Search, Depth First Search, Spanning trees, Shortest path algorithm, topological sorting.

Symbol Tables: static tree tables, dynamic tree tables, hash tables

Text Books

S.N	Title	Authors	Edition	Publisher
1	Fundamentals of Data Structure	Horowitz and Sahani		CBS Publications
2	Data Structures using	Tanenbaum		C Pearson Education
3	Data structure and Algorithm	Lafore		BPB Publication

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Data Structure and Programme Design in C	Kruse, Leung and Tondo		PHI
2	Schaum's outline: Date Structures	Seymour Lipschutz		Tata Mc Graw Hill
3	An Introduction to DS with applications	Trembley and sorenson		Mc Graw Hill

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
DS301P	Data Structures Lab			4	2	25	25	50

Course Objectives	Course Outcomes
This course is intended ● To emphasize the application of data structures in developing and implementing efficient programs and algorithm	**Students will be able to** ● Select appropriate data structures as applied to specified problem definition. ● implement Linear and Non-Linear data structures. ● implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures. ● Students will be able to determine and analyze the complexity of given Algorithms.

Expt. No.	Title of the experiment
1	To design and implement basic C program using arrays & structures.
2	To implement a Menu driven program for linear & Binary search methods and demonstrate their constraints.
3	To implement a Menu driven program for Sorting methods and analyze their performances.
4	To implement a Program to demonstrate the working of a stack.
5	To implement a Program to demonstrate the working of a Queue
6	To implement a Program to apply the concepts of linked list
7	To implement the non linear data structure binary tree
8	To implement BFS and DFS in graph

Text Books

S.N	Title	Authors	Edition	Publisher
1	Data Structure and Programme Design in C	Kruse, Leung and Tondo		PHI
2	Schaum's outline: Date Structures	Seymour Lipschutz		Tata Mc Graw Hill
3	An Introduction to DS with applications	Trembley and sorenson		Mc Graw Hill

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
DS302T	Digital Circuits & Fundamentals of Microprocessor	3			3	30	70	100

Course Objectives	Course Outcomes
This course is intended ● To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits. ● To impart how to design Digital Circuits. ● Understand 8086 microprocessor concepts, architecture and programming.	**Students will be able to** ● represent numerical values in various number systems and will demonstrate the knowledge of: logic gates (AND, OR, NAND, NOR, XOR, XNOR), Boolean algebra, DeMorgan's Theorems, Karnaugh map. ● analyze and design digital combinational circuits ● analyze and design sequential digital circuits. ● describe the architecture& organization of 8086 microprocessor along with instruction set format ● list, describe and use different types of instructions, directives & interrupts and develop assembly language program

Unit I **[7Hrs]**

Number Systems & Code Conversion Number Systems & Code conversion, Boolean Algebra & Logic Gates, Truth Tables, Universal Gates, Simplification of Boolean functions, SOP and POS methods –Simplification of Boolean functions using K-maps,Signed and Unsigned Binary Numbers.

Unit II **[7Hrs]**

Combinational Circuits Combinational Logic Circuits: Adders & Subtractors, Multiplexers, Demultiplexers, Encoders, Decoders, Programmable Logic Devices

Unit III **[7Hrs]**

Sequential Circuits Sequential Logic Circuits: RS, Clocked RS, D, JK, Master Slave JK, T Flip-Flops, Shift Registers, Types of Shift Registers, Counters, Ripple Counter, Synchronous Counters, Asynchronous Counters,Up-Down Counter.

Unit IV **[7Hrs]**

Fundamentals of 8086 Microprocessors 8086 microprocessor, Functional Diagram, register organization 8086, Flag register of 8086 and its functions, Addressing modes of 8086, Pin diagram of 8086, Minimum mode & Maximum mode operation of 8086, Interrupts in 8086.

Unit V **[8Hrs]**

Programming of 8086 Micro-processor Instruction set of 8086, Assembler directives, Procedures and Macros, Simple programs involving arithmetic, logical, branch instructions, Ascending, Descending and Block move programs, String Manipulation Instructions.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Digital Design	M. Morris Mano, Michael D. Ciletti	5th Edition	Pearson Education
2	Digital Electronics: Principles, Devices and Applications	Anil K. Maini		John Wiley & Sons, Ltd
3	Microprocessor and Microcontrollers	N. Senthil Kumar, M. Saravanan, S. Jeevanathan		Oxford Publishers

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Digital Fundamentals –A Systems Approach	Thomas L. Floyd		Pearson
2	Fundamentals of Logic Design	Charles H. Roth	5th Edition	Cengage Learning
3	Microprocessors and Interfacing.	D.V.Hall	2nd Edition	TMGH
4	The 8051 microcontroller	Kenneth.J.Ayala	3rd Edition	Cengage Learning

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
DS302P	Digital Circuits & Fundamental of Microprocessor			2	1	25	25	50

Course Objectives	Course Outcomes
This course is intended ● To introduce the basic concepts and laws involved in the Boolean algebra and logic families and digital circuits. ● To familiarize with the different logic gates, and combinational and sequential circuits utilized in the different digital circuits and systems. ● To introduces basic instruction of microprocessor.	**Students will be able to** ● understand the Combinational Circuits using Logic Gates. ● design Arithmetic and Logical Circuits. ● demonstrate understanding of flip-flops & Sequential circuits ● understand the Basic Fundamentals of 8086 Microprocessor

Expt. No.	Title of the experiment
1	To verify the truth table of different logic gates.
2	To study and verify the NAND & NOR gates as universal gates.
3	To study and verify truth table of Half adder and Full Adder.
4	To study and verify truth table of Multiplexer & Demultiplxer.
5	To study and verify truth table of different flip flops.
6	To study and verify 4 bit ripple counter.
7	Write and execute an ALP for addition & Subtraction of two 16 bit numbers.
8	Write and execute an ALP to find 1's complement of 16 bit a number.
9	Write and execute an ALP for sorting of data in ascending order and find largest number in an array.
10	Mini -Project

Text Books

S.N	Title	Authors	Edition	Publisher
1	Digital Integrated Electronics	Herbert Taub		McGraw Hill.
2	Digital Logic and Computer Design	Morris Mano		PHI
3	Digital Integrated Electronics	Herbert Taub		McGraw Hill.
4	Digital Electronics Logic and System	James Bingnell, Robert Donovan		

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
DS303T	Computer Networks	3			3	30	70	100

Course Objectives	Course Outcomes
This course is intended ● To obtain a theoretical understanding of various aspects of Data Communication & Computer Network and explore the functions of layered architecture ● To explain the concept of layered architecture when two entities need to communicate with each other. ● To enable the students to understand the basic cryptography concepts related to network Security.	**Student will be able to** ● Student will be able to describe the basics of network and its hardware components ● Students will be able to explain the different network models. ● Students will be able to interpret the various functions and protocols of network models. ● Students will be able to assess different transmission media with its connectors. ● Students will be able to summarize the concepts of network security and privacy.

Unit I **[8Hrs]**

Introduction to Data Communication and Computer Networks: Definition, Characteristics, Components, Data Representation, Types of Data flow, Need of Computer Networks, advantages and disadvantages, Goals and Application of Computer Network, Network Hardware Components, Computer Network Criteria, Physical structure(types of connection, physical topology), Types of network, Classification of Local Area network.

Unit II **[8Hrs]**

Network Layered Model: Emergence of Network and Reference Models, Protocol Hierarchies, Network Model, Design issues for the Layers, Interfaces and Services, Service primitives, Connection Oriented and Connectionless types of services, OSI Reference Model & architecture, TCP/IP reference model, types of addressing.

Unit III **[8Hrs]**

Physical Layer: Types of signals, Transmission Mode, Transmission Impairment, Data rate Limits, Performance, Data encoding Techniques (Line Coding Methods), Transmission Media, Switching techniques, Introduction to RIFD, Satellite Communication.

Data Link Layer: Framing methods, error detection and correction methods, Protocols for Noise and Noiseless channels,MAC layer multiple access protocols (CSMA,CSMA/CD,CSMA/CA), channelization(FDMA, TDMA, CDMA), Introduction to Virtual LAN.

Unit IV **[8Hrs]**

Network Layer: IP Routing Table, Routing in the Internet I- Intra-Domain Routing, Routing in the Internet II- Routing protocols, Routing in the Internet III- Inter-domain Routing, Introduction to IPv6 Addressing scheme.

Transport Layer: Elements of Transport Protocols, Addressing technique, Connection Oriented Service, TCP protocol and header format, TCP checksum calculation, TCP transmission policy, UDP protocol and header format, UDP checksum calculation, SCTP protocol, QoS parameters, Congestion control methods, Traffic shaping algorithms.

Session and Presentation layer: Session layer design issues, responsibilities of Presentation layer

Unit V **[8Hrs]**

Application Layer and Network Security: Responsibilities of Application Layer, Application Layer Services (DNS, E-mail, MIME, SMTP, FTP, TFTP),Architecture of WWW and HTTP, Introduction to Cryptography, Security Services, Introduction to Symmetric and Asymmetric Key Cryptography, Digital Signature.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Data Communications and Networking	Behrouz A Forouzan	4th Edition	McGraw Hill
2	Computer Networks	Andrew S. Tanenbaum		PHI
3	A Course in Computer Networks	Dr. Sanjay Sharma	3rd Edition	Katson Books

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Data and Computer Communication	William Stallings		
2	Computer Networking :A Top-Down Approach	James F. Kurose, Keith W. Ross		Pearson
3	Computer Networks Principles, technologies and Protocols for Network	Natalia Olifer		Wiley India

	Design			

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
DS304T	Introduction to Data Science	3			3	30	70	100

Course Objectives	Course Outcomes
This course aims to provide students with introductory knowledge of several data science techniques that can be used for data analysis	**Student will be able to** ● demonstrate basic data science concepts ● apply pre-processing techniques on collected data ● perform analysis of data ● develop data model ● evaluate the data model

Unit I **[7Hrs]**

Introduction: Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.

Unit II **[7Hrs]**

Data Collection and Data Pre-Processing: Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

Unit III **[6Hrs]**

Exploratory Data Analytics: Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots –Pivot Table – Heat Map – Correlation Statistics – ANOVA.

Unit IV **[6Hrs]**

Building and evaluation of models for: Association analysis, Recommendation systems, Time Series Data and Text Analysis,
Measures for In-sample Evaluation – Prediction and Decision Making.

Unit V **[7Hrs]**

Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting – Under Fitting and Model Selection – Testing Multiple Parameters by using Grid Search.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Smarter Decisions : The Intersection of IoT and Data Science	Jojo Moolayil		PACKT
2	Doing Data Science	Cathy O'Neil, Rachel Schutt		O'Reilly
3	Data Science and Big data Analytics	David Dietrich, Barry Heller, Beibei Yang		EMC 2013
4	Handbook of Research on Cloud Infrastructures for Big Data Analytics	Raj, Pethuru		IGI Global
5	The Data Science Design Manual	Skiena, Steven S		CRC press

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Practical Data Science with R	Nina Zumel, John Mount.		Manning
2	Data Science for business	F. Provost, T Fawcett		

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
DS305P	Computer Lab - I			2	1	25	25	50

Course Objectives	Course Outcomes
This course is intended ● Master the use of the R and RStudio interactive environment ● Explore and understand how to use the R documentation ● Explore different data types and data structures in R language ● Understand how to create and manipulate data in R language	**Students will be able to** ● explore different R language constructs ● install RStudio and will use it for writing R- programs ● perform R documentation ● create and manipulate data in R language

Expt. No.	Title of the experiment
1	Study of basic Syntax's in R and data analysis using MS-Excel
2	Implement of vector data objects operations using R Programming
3	Study and Implement matrix, array and factors in R Programming
4	Write a R program to create a list containing strings, numbers, vectors and a logical values
5	Implement and use data frames in R Programming
6	Create Sample (Dummy) Data in R and perform data manipulation with R
7	Write a R program to extract first two rows from a given data frame
8	Write a R program to sort a given data frame by multiple column(s).
9	Write a R program to select some random rows from a given data frame
10	Write a R program to create a vector of a specified type and length. Create vector of numeric, complex, logical and character types of length 6
11	Write a R program to find Sum, Mean and Product of a Vector.
12	study and implementation of various control structures in R

Text Books

S.N	Title	Authors	Edition	Publisher
1	R for Data Science	Hadley Wickham and Ganett Gorlemund	1st Edition	O'Reilly
2	The Art of R Programming-A Tour of Statistical Software Design	Norman Matlott	1st Edition	No Starch Press