NARAYANA ENGINEERING COLLEGE::NELLORE

AUTONOMOUS

M.C.A

Course Structure

&

Syllabus

(2021-22 academic year)

(NECR M.C.A 21)

(w.e.f AY: 2021 – 22)

NARAYANA

ENGINEERING COLLEGE

(AUTONOMOUS)

NARAYANA ENGINEERING COLLEGE::NELLORE

AUTONOMOUS

VISION

- To be one of the nation's premier Institutions for Technical and Management Education and a key contributor for Technological and Socio-economic Development of the Nation.

MISSION

- To produce technically competent Engineers and Managers by maintaining high academic standards, world class infrastructure and core instructions.
- To enhance innovative skills and multi disciplinary approach of students through well experienced faculty and industry interactions.
- To inculcate global perspective and attitude of students to face real world challenges by developing leadership qualities, lifelong learning abilities and ethical values.

NARAYANA ENGINEERING COLLEGE::NELLORE
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DEPARTMENT OF MCA

R21 Course Structure for MCA w.e.f AY: 2021 – 22

SEMESTER- I

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
21MC101	PC	Mathematical Foundations of Computer Science	3	1	0	3	4	40	60	100
21MC102	PC	Problem Solving Through C	3	0	0	3	3	40	60	100
21MC103	PC	Python Programming	3	0	0	3	3	40	60	100
21MC104	PC	Database Management Systems	3	0	0	3	3	40	60	100
21MC105	PC	Operating Systems	3	0	0	3	3	40	60	100
21MC106	PC	Computer Organization and Architecture	3	0	0	3	3	40	60	100
21MC107	HS	Communication Skills Lab	0	1	2	3	2	40	60	100
21MC108	PC	Problem Solving Through C Lab	0	0	3	3	1.5	40	60	100
21MC109	PC	Python Programming Lab	0	0	3	3	1.5	40	60	100
21MC110	PC	Database Management Systems Lab	0	0	3	3	1.5	40	60	100
21MC111	EEC	Career Competency Development Program - I	0	0	3	3	1.5	40	60	100
		Activity Point Programme		During the Semester				20 Points		
		Total	**18**	**2**	**14**	**33**	**27**	**440**	**660**	**1100**

SEMESTER- II

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
21MC201	PC	Data Structures	3	1	0	4	**4**	**40**	**60**	**100**
21MC202	PC	Object Oriented Programming through Java	3	0	0	3	**3**	**40**	**60**	**100**
21MC203	PC	Foundations of Data Science	3	0	0	3	**3**	**40**	**60**	**100**
21MC204	PC	Software Engineering	3	0	0	3	**3**	**40**	**60**	**100**
21MC205	BS	Managerial Economics and Financial Analysis	3	0	0	3	**3**	**40**	**60**	**100**
-	PE	Professional Elective – I	3	0	0	3	**3**	**40**	**60**	**100**
21MC206	PC	Data Structures Lab	0	0	3	3	**1.5**	**40**	**60**	**100**
21MC207	PC	Object Oriented Programming through Java Lab	0	0	3	3	**1.5**	**40**	**60**	**100**
21MC208	PC	Foundations of Data Science Lab	0	0	3	3	**1.5**	**40**	**60**	**100**
21MC209	EEC	Career Competency Development Program - II	0	0	3	3	**1.5**	**40**	**60**	**100**
21MC210	EEC	Value Added Course/ Certificate Course	0	0	0	0	**1**	**40**	**60**	**100**
		Activity Point Programme		During the Semester				25Points		
		Total	**18**	**1**	**12**	**31**	**26**	**440**	**660**	**1100**

SEMESTER- III

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
21MC301	PC	Design and analysis of Algorithms	3	0	0	3	**3**	**40**	**60**	**100**
21MC302	PC	Computer Networks	3	0	0	3	**3**	**40**	**60**	**100**
21MC303	PC	Artificial Intelligence	3	0	0	3	**3**	**40**	**60**	**100**
21MC304	PC	Web Technologies	3	0	0	3	**3**	**40**	**60**	**100**
-	PE	Professional Elective – II	3	0	0	3	**3**	**40**	**60**	**100**
-	PE	Professional Elective –III	3	0	0	3	**3**	**40**	**60**	**100**
21MC305	PC	Computer Networks Lab	0	0	3	3	**1.5**	**40**	**60**	**100**
21MC306	PC	Artificial Intelligence Lab	0	0	3	3	**1.5**	**40**	**60**	**100**
21MC307	PC	Web technologies Lab	0	0	3	3	**1.5**	**40**	**60**	**100**
21MC308	EEC	Career Competency Development Program -III	0	0	3	3	1.5	40	60	100
21MC309	EEC	Industry Oriented Course	0	0	0	0	1	40	60	100
		Activity Point Programme		During the Semester				25 Points		
		Total	**18**	**0**	**12**	**30**	**25**	**440**	**660**	**1100**

SEMESTER- IV

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
-	PE	Professional Elective – IV	3	0	0	3	3	40	60	100
-	PE	Professional Elective - V	3	0	0	3	3	40	60	100
21MC401	PR	Project	-	-	-	-	16	60	140	200
21MC402	PR	Comprehensive Viva Voce	-	-	-	-	2	40	60	100
		Total	6	0	0	6	24	180	320	500

PROFESSIONAL ELECTIVES

SEMESTER	COURSE CODE	SUBJECTS
Professional Elective – I		
I Year II Semester Professional Elective	21MC211	1.Linux Programming
	21MC212	2.Object Oriented Analysis and Design
	21MC213	3.E-Commerce
Professional Elective – II		
II Year I Semester Professional Elective	21MC310	1. Big Data Analytics
	21MC311	2. Software Architecture
	21MC312	3. Data Warehousing and Data Mining
Professional Elective – III		
II Year I Semester Professional Elective	21MC313	1. Mobile Application Development
	21MC314	2. Software Project Management
	21MC315	3. Machine Learning
Professional Elective – IV		
II Year II Semester Professional Elective	21MC403	1. Cloud Computing
	21MC404	2. Software Quality Assurance
	21MC405	3. Deep Learning
Professional Elective – V		
II Year II Semester Professional Elective	21MC406	1. R-Programming
	21MC407	2. Software Testing
	21MC408	3. Cyber Security

HUMANITIES AND SOCIAL SCIENCES (HS)

SEMESTER	COURSE CODE	SUBJECT	CREDITS
I	21MC107	Communication skills Lab	**2**
II	21MC205	Managerial Economics and Financial Analysis	**3**
		TOTAL	**5**

PROFESSIONAL CORE (PC)

SEMESTER	COURSE CODE	SUBJECT	CREDITS
I	21MC101	Mathematical Foundations of Computer Science	4
	21MC102	Problem Solving Through C	3
	21MC103	Python Programming	3
	21MC104	Database Management Systems	3
	21MC105	Operating Systems	3
	21MC106	Computer Organization and Architecture	3
	21MC108	Problem Solving Through C Lab	1.5
	21MC109	Python Programming Lab	1.5
	21MC110	Database Management Systems Lab	1.5
		Total	**23.5**
II	21MC201	Data Structures	4
	21MC202	Object Oriented Programming through Java	3
	21MC203	Foundations of Data Science	3
	21MC204	Software Engineering	3
	21MC206	Data Structures Lab	1.5
	21MC207	Object Oriented Programming through Java Lab	1.5
	21MC208	Foundations of Data Science Lab	1.5
		Total	**17.5**
III	21MC301	Design and analysis of Algorithms	3
	21MC302	Computer Networks	3
	21MC303	Artificial Intelligence	3
	21MC304	Web Technologies	3
	21MC305	Computer Networks Lab	1.5
	21MC306	Artificial Intelligence Lab	1.5
	21MC307	Web technologies Lab	1.5
		Total	**16.5**
		TOTAL	**57.5**

PROFESSIONAL ELECTIVES (PE)

SEMESTER	SUBJECT	CREDITS
II Sem	Professional Elective I	3
III Sem	Professional Elective II	3
	Professional Elective III	3
IV Sem	Professional Elective IV	3
	Professional Elective V	3
	TOTAL	**15**

PROJECT(PR)

SEMESTER	COURSE CODE	SUBJECT	CREDITS
IV Sem	21MC401	Project	16
	21MC402	Comprehensive Viva – Voce	02
		TOTAL	**18**

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

SEMESTER	COURSE CODE	SUBJECT	CREDITS
I Sem	21MC111	Career Competency Development Program – I	**1.5**
II Sem	21MC209	Career Competency Development Program – II	**1.5**
	21MC210	Value added course/Certificate course	**1**
III Sem	21MC308	Career Competency Development Program - III	**1.5**
	21MC309	Industry Oriented Course	**1**
		TOTAL	**06.5**

OVERALL CREDITS

SL NO	SUBJECT AREA	CREDITS PER SEMESTER				CREDITS
		I	II	III	IV	
1	HS	2	3	--	--	**05**
2	PC	23.5	17.5	16.5	--	**57.5**
3	PE	--	3	6	6	**15**
4	EEC	1.5	2.5	2.5	--	**6.5**
5	PR	--	--	--	18	**18**
TOTAL		**27**	**26**	**25**	**24**	**102**

NARAYANA ENGINEERING COLLEGE::NELLORE								
21MC101	MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	3	1	0	64	4	40	60	100

Pre-requisite: Student need to have knowledge in mathematical basics in computers

Course Objectives:

- To covert the statements logical expressions and logical theorem proving.
- To understand the basics to design the hasse diagrams.
- To understand the homomorphism and Isomorphism concepts by algebraic structures.
- To understand the basics of counting methods.
- To understanding the recurrence relations and generating functions by mathematical induction.
- To understand of basics of trees and graphs.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	List the basics of formulate simple definitions and proofs in discrete mathematics **(BL-1)**
CO 2	Explain the binary relations, functions, algebraic system and understand groups related to the computer science **(BL-2)**
CO 3	Analyze the Elementary Combinotrics and Pigeon-hole principle **(BL-4)**
CO 4	Understand the Coefficients of generating functions and understand the recurrence relations related to computer programming **(BL-1)**
CO 5	Apply the basic concepts of graphs and understand the spanning tree **(BL-3)**

CO-PO Mapping

CO	PO												PSO	
	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	1	3	3											
CO2	2	3	2	2									2	
CO3	2			2	1							1		
CO4	3	2	3										1	2
CO5		1		2									1	2

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	STATEMENTS AND PREDICATE CALCULUS	13 H

Statements and notations, connectives, well-formed formulas, truth tables, tautology, Equivalence implication; Normal forms: Disjunctive normal forms, Conjunctive normal forms, Principle Disjunctive normal forms, Principle Conjunctive normal forms.Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction.

Atthe endof theModule1,studentswillbeableto:

1. Evaluatedifferent truthtablesandpropositionallogics**(BL-3)**
2. Identifypredicates,quantifiersandproperequivalences**(BL-2)**
3. Examinenormalformsandtherules ofinference**(BL-3)**

MODULE- 2	SET THEORY	13H

Properties of binary relations, equivalence, compatibility and partial ordering relations, lattices, Hasse diagram. Inverse function, composition of functions, recursive functions. Lattices as partially ordered sets; Definition and examples, properties of lattices.Algebraic systems, Examples and general properties, Semi groups and Monoids, groups, and sub groups, Homomorphism, Isomorphism.

Atthe endof theModule2,studentswillbeableto: 1. Illustratethebasics ofsettheoryandsetoperations**(BL-2)** 2. Examinethepropertiesofrelations andordering**(BL-4)** 3. Analyzedifferentfunctions**(BL-4)**		
MODULE- 3	**ELEMENTARY COMBINATORICS**	**12H**
Basics of counting, Permutations and Combinations, permutations and combinations with repetitions, the binomial theorem, multinomial theorem, generalized Inclusion-Exclusion principle, Pigeon-hole principle and its applications.		
Atthe endof theModule 3,studentswillbeableto: 1. Elaborate the knowledge on the Permutations and combinations**(BL-4)** 2. Illustrate the different Theorems in Elementary Combinatorics**(BL-4)** 3. Understand about the Inclusion and Exclusion principle**(BL-2)**		
MODULE- 4	**GENERATING FUNCTIONS &RECURRENCE RELATIONS**	**13 H**
Function of Sequences, Calculating Coefficients of generating functions. Recurrence relations, Solving recurrence relation by substitution and Generating functions, the method of Characteristic roots, solution of Inhomogeneous Recurrence Relations.		
Atthe endof theModule4,studentswillbeableto: 1. Understand about the basic usage of Recurrence Relations**(BL-2)** **2.** Developing solutions for Recurrence Relations by substitutions methods **(BL-5)** **3.** Applying of Recurrence Relations for advanced algorithms **(BL-3)**		
MODULE- 5	**GRAPH THEORY**	**13 H**
Basic concepts of graphs, isomorphic graphs, Euler graphs, Hamiltonian graphs, planar graphs, graph coloring, digraphs, directed acyclic graphs, weighted graphs, Chromatic numbers. Trees, BFS, DFS, Spanning trees, Minimal spanning trees.		
Atthe endof theModule5,studentswillbeableto: 1. Modeldifferentgraphsandrepresent them **(BL-3)** 2. Analyzeshortest pathproblems andcolorthegraphs**(BL-4)** 3. Examinedifferenttreesandtheirapplications**(BL-4)**		
	Total hours:	**64 Hours**

Content beyond syllabus: Finding Minimal cost Spanning Tree using Prim's Algorithm.

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	**Statements And Predicate Calculus**	CO1	https://nptel.ac.in/courses/106106094/
2	**Set Theory**	CO2	https://byjus.com/maths/discrete-mathematics/
3	**Elementary Combinatorics**	CO3	https://byjus.com/maths/permutation-and-combination/
4	**Generating Functions &Recurrence Relations**	CO4	https://www.coursera.org/lecture/enumerative-combinatorics/linear-recurrence-relations-definition-ITD1
5	**Graph Theory**	CO5	https://www.udemy.com/tutorial/graph-theory-algorithms/graph-theory-introduction/

Text Book(s):

1. Discrete Mathematical Structures with Applications to Computer Science, J.P.Tremblay, R.Manohar, Mc.Grahill, 2001.
2. Mathematical Foundations of Computer Science, P.Chandrasekharaiah, Prism publications.

Reference Book(s):

1. Discrete Mathematics for Computer Scientists & Mathematicians, second edition, J.L.Mott, A. Kandel, T.P. Baker, PHI
2. Discrete Mathematical Structures, Mallik and Sen, Cengage Learning.
3. Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon Cutler Ross, PHI/ Pearson Education.
4. Discrete Mathematics and its Applications, Kenneth H.Rosen, 6th edition, TMH.

Online Resources:

1. https://people.eecs.berkeley.edu/~daw/teaching/cs70-s05/

2. https://www.math.uvic.ca/faculty/gmacgill/guide/recurrences.pdf

3.www.youtube.com/watch?v=ihQyZ7bJcRE&list=PLU6SqdYcYsfKqtoZ2uDwgMya5m_x6cbOG

4. http://www.zib.de/groetschel/teaching/WS1314/BondyMurtyGTWA.pdf

Web Resources:

1. http://www.cs.odu.edu/~cs381/cs381content/web_course.html
2. http://www.cse.iitd.ernet.in/~bagchi/courses/discrete-book
3. http://www.saylor.org/course/cs202/
4. http://www.nptel.ac.in/courses/106106094/
5. http://www.tutorialspoint.com/discrete_mathematics
6. http://www.dmtcs.org/dmtcs-ojs/index.php/dmtcs
7. https://www.javatpoint.com/recurrence-relations

NARAYANA ENGINEERING COLLEGE::NELLORE								
21MC102	PROBLEM SOLVING THROUGH C							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	3	0	0	48	3	40	60	100

Pre-requisite: Mathematical Knowledge, Analytical and Logical skills

Course Objectives:

1. To understand various steps in Program Development.
2. To understand the basic concepts in C Programming Language.
3. To learn the syntax and semantics of a C Programming language.
4. To learn how to write modular and readable C Programs.
5. To learn structured programming approach for Problem Solving.

Course Outcomes: After successful completion of the course, Student will be able to:

CO 1	Identify methods to solve a problem through computer programming. **(BL - 3)**
CO 2	Understand the use of basic elements of C language. **(BL - 2)**
CO 3	Implement C programming by using various control structures& functions. **(BL - 3)**
CO 4	Apply the arrays and pointers for solving problems. **(BL - 3)**
CO 5	Develop the C programs by using user-defined data types and files. **(BL - 3)**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3											1	
CO2	1	2	1										1	
CO3	1	2	1		2								2	2
CO4	3	3	2	2								1	2	
CO5	2	2	2	2								1	2	

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	Fundamentals of Programming	9 H

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Structured Programming Concept, Algorithms, Flowcharts, How to Develop a Program.

Fundamental Algorithms: Exchanging the values of Two Variables, Counting, Summation of a set of numbers, Factorial computation, Generation of the Fibonacci Sequence, Reversing the digits of an integer.

At the end of the Module 1, students will be able to:

1. Solve problems using language independent notations. **(BL - 3)**
2. Understand the compilers and interpreters. **(BL - 2)**

3. Understand Structured Programming.**(BL - 2)** 4. Develop algorithms and flowcharts for problems. **(BL - 3)**		
MODULE -2	**Basic Elements of C**	**9 H**
Basics of C: Introduction, Character Set, Structure of a C Program, A Simple C Program, Variables, Data Types and Sizes, Declaration, how does The Computer Store Data in Memory, Identifiers, Keywords, Constants, Assignment, and Initialization. **Operators and Expressions:** Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operators, Conditional Operator, Comma operator, sizeof operator, Expressions, L values and R values, Expression Evaluation- Precedence and Associativity, Type Conversion.		
At the end of the Module 2, students will be able to: 1. Understand the basic structure of a program in C. **(BL - 2)** **2.** Understand tokens in C language. **(BL - 2)** **3.** Illustrate the working of expressions evaluation. **(BL - 2)** 4. Understand the rules of type conversion. **(BL - 2)**		
MODULE-3	**Data Input / Output, Control Statements and Functions**	**11 H**
Input and Output: Basic Screen and Keyboard I/O in C, Formatted Input and Output, Unformatted Input and Output Functions **Control Statements:**Selection Statements - if, Nested if, if-else, Nested if-else, else-if ladder, switch, Looping Statements - while, do-while, for, Nested loops, Unconditional Statements - goto, break, continue, return. **Functions:** Introduction, Using Functions, Passing Arguments to a Function, Working with Function, Scope and Extent, Recursion, The C Preprocessor, Storage classes, Multifile programs.		
At the end of the Module 3, students will be able to: 1. Explain the formatted and unformatted I/O functions**. (BL - 2)** 2. Select the control structure for solving the problem**.(BL - 3)** 3. Apply modular approach for solving the problem. **(BL - 3)**		
MODULE-4	**Arrays and Pointers**	**10 H**
Arrays and Strings: Introduction, One-Dimensional Array, Multidimensional Arrays, Passing Arrays to Function, Strings - Declaration, Initialization, Printing Strings, String Input, Character Manipulation, String Manipulation, Arrays of Strings. **Pointers:** Fundamentals, Pointer Declarations, Operations on pointers, Passing Pointers to a Function, Pointers and Arrays, Arrays of Pointers, Pointer to Pointer, Pointer to Functions, Command line arguments, Dynamic Memory Management.		
At the end of the Module 5, students will be able to: **1.** Organize the individual data elements to simplify the solutions**. (BL - 3)** 2. Understand the concept of pointers. **(BL - 2)** 3. Understand the efficient memory utilization.**(BL -2)**		
MODULE-5	**User-Defined Data Types and Files**	**9 H**
Structures and Unions: Basics of Structures, Nesting of Structures, Arrays of Structures, Structures and Pointers, Structures and Functions, Self-Referential Structures, Unions, Bit-fields, Enumerations, typedef.		

Files: Introduction, Using Files in C, Working with Text Files, Random Accesses to Files of Records.	
At the end of the Module 6, students will be able to: 1. Organize heterogeneous data. **(BL - 3)** **2.** Understand the concept of Self-Referential Structures. **(BL - 2)** 3. Understand the working of files.**(BL - 2)**	
Total hours:	**48 HOURS**

Content Beyond Syllabus:

1. Analysis of Algorithms
2. Binary Files
3. Variable Length Argument Lists

Self-Study:

Contents to promote self-Learning:

SNo	Module	Reference
1	Fundamentals of Programming	https://nptel.ac.in/courses/106/106/106106127/ [Lec 1] https://nptel.ac.in/courses/106/105/106105214/ [Week 1 - Lec 1 To 2] https://nptel.ac.in/courses/106/105/106105171/ [Week 1 - Lec 1 To 4]
2	Basic Elements of C	https://nptel.ac.in/courses/106/105/106105171/ [Week 1 - Lec 5] https://nptel.ac.in/courses/106/105/106105171/ [Week 2 - Lecture 7 To 10] https://nptel.ac.in/courses/106/105/106105171/ [Week 3 - Lec 11 To 14] https://nptel.ac.in/courses/106/106/106106127/ [Lec 2] https://nptel.ac.in/courses/106/106/106106127/ [Lec 3] https://nptel.ac.in/courses/106/106/106106127/ [Lec 4]
3	Data Input / Output and Control Statements and Functions	https://nptel.ac.in/courses/106/106/106106127/ [Lec 5] https://nptel.ac.in/courses/106/105/106105171/ [Week 3 - Lec 15] https://nptel.ac.in/courses/106/105/106105171/ [Week 4 - Lec 16 To 20] [Week 5 - Lec 21 To 25] https://nptel.ac.in/courses/106/106/106106127/ [Lec 6 & 7] https://nptel.ac.in/courses/106/105/106105171/ [Week 7 - Lec 35]

		[Week 8 - Lecture 36 To 40] https://nptel.ac.in/courses/106/105/106105171/ [Week 11 - Lec 53 To 54] https://nptel.ac.in/courses/106/106/106106127/ [Lec 20 To 27]
4	Arrays and Pointers	https://nptel.ac.in/courses/106/105/106105171/ [Week 6 - Lec 26 To 30] [Week 7 - Lec 32 To 34,48] [Week 12 - Lec 58, 59, 61] https://nptel.ac.in/courses/106/106/106106127/ [Lec 9 To 19]
5	User-Defined Data Types and Files	https://nptel.ac.in/courses/106/105/106105171/ [Week 11 - Lec 55, 56, 57, 60] https://nptel.ac.in/courses/106/106/106106127/ [Lec 36, 37, 38] https://nptel.ac.in/courses/106/106/106106127/ [Lec 60]

Text Book(s):

1. Pradip Dey, and Manas Ghosh, "Programming in C", 2018, Oxford University Press.
2. Byron Gottfried, Schaum's Outline of Programming with C, 4th Edition, 2018, McGraw-Hill.

Reference Books :

1. R.G. Dromey, "How to Solve it by Computer". Pearson,2014.
2. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson.
3. Ajay Mittal, Programming in C: A Practical Approach , 3/e, Pearson Publication
4. Schildt and Herbert, C: The Complete Reference,4th Edition, McGraw Hill, 2020
5. Somashekara, M. T., Guru, D. S., Manjunatha, K. S., Problem Solving with C, 2nd Edition, PHI Learning, 2018
6. Paul Deitel, Deitel& Harvey Deitel, C How to Program,6th Edition, Pearson Education
7. Jeri R. Hanly, Elliot B. Koffman, Ashok Kamthane and A.Ananda Rao, Programming in C and Data Structures, 1st Edition, Pearson Education, 2010.
8. H.Cheng, C for Engineers and Scientists, Mc.Graw-Hill International Edition Education / PHI, 2009
9. Yashavant P. Kanetkar, Let us C, 16th Edition, BBP Publications, Delhi, 2017.

Online Resources / Web Resources:

1. https://nptel.ac.in/courses/106/105/106105171/
2. https://nptel.ac.in/courses/106/106/106106127/
3. https://www.youtube.com/playlist?list=PLVlQHNRLflP8IGz6OXwlV_lgHgc72aXlh
4. https://www.youtube.com/watch?v=8PopR3x-VMY
5. https://www.youtube.com/watch?v=vl794HKeXug
6. https://books.goalkicker.com/CBook/
7. https://www.tutorialspoint.com/cprogramming/index.htm
8. https://www.programiz.com/c-programming
9. https://www.javatpoint.com/c-programming-language-tutorial
10. https://www.edureka.co/blog/c-programming-tutorial/
11. https://data-flair.training/blogs/c-tutorial/
12. https://www.programmingsimplified.com/c-program-examples
13. https://www.w3schools.in/category/c-tutorial/
14. C Programming Notes for Professionals book: https://books.goalkicker.com/CBook/

NARAYANA ENGINEERING COLLEGE:NELLORE								
21MC203	PYTHON PROGRAMMING							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	3	0	0	48	3	40	60	100

Pre-requisite: **K**nowledge of Mathematics and Basic Programming Language

Course Objectives:

1. To learn the fundamentals of python.
2. To implement python programs for conditional loops and functions.
3. To handle the compound data using python lists, tuples, sets, dictionaries.
4. To learn the files, modules, packages concepts.
5. To introduce the concepts of class and exception handling using python.

Course Outcomes: After successful completion of the course, Student will be able to:

CO 1	Summarize the fundamental concepts of python programming. (BL - 2)
CO 2	Apply the basic elements and constructs the python to solve logical problems.(BL-3)
CO 3	Organize data using different data structures of python. (BL - 3)
CO 4	Implement the files modules and packages in programming. (BL - 3)
CO 5	Apply object-oriented concepts to build simple applications. (BL - 3)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	3	2	1	1										1
CO2	3	3	2	2	1	2							1	1
CO3	1	1	3	2	2								1	
CO4	3	3	2	2										
CO5	1	3	2	2									1	1

1: Low, 2-Medium, 3- High

COURSE CONTENT		
MODULE – 1	**Introduction to Python**	**9 H**

Introduction: History of Python, Features of Python Programming, Applications of Python Programming, Running Python Scripts, Comments, Typed Language, Identifiers, Variables, Keywords, Input/output, Indentation, Data types, Type Checking, range( ), format( ), Math module.

At the end of the Module 1, students will be able to:

1. Learn the basics of python. (BL - 1)
2. Write the python programs. (BL - 1)

3. Understand concept of type checking. (BL - 2)		
MODULE -2	**Operators Expressions and Functions**	**10 H**
Operators Expressions: Arithmetic, Assignment, Relational, Logical, Boolean, Bitwise, Membership, Identity, Expressions and Order of Evaluations, Control Statements. **Functions**: Introduction, Defining Functions, Calling Functions, Anonymous Function, Fruitful Functions and Void Functions, Parameters and Arguments, Passing Arguments, Types of Arguments, Scope of variables, Recursive Functions.		
At the end of the Module 2, students will be able to: 1. Solve the problems using operators, conditional and looping. (BL - 3) 2. Solve the problems using the functions. (BL -3) 3. Apply the principle of recursion to solve the problems. (BL-3)		
MODULE-3	**Strings, Lists,Tuples, and Dictionaries**	**10 H**
Strings, Lists,Tuples, and Dictionaries: Strings- Operations, Slicing, Methods, List- Operations, slicing, Methods, Tuple- Operations, Methods, Dictionaries- Operations, Methods, Mutable Vs Immutable, Arrays Vs Lists, Map, Reduce, Filter, Comprehensions.		
At the end of the Module 3, students will be able to: 1. Write programs for manipulating the strings. (BL - 1) 2. Understand the knowledge of data structures like Tuples, Lists, and Dictionaries.(BL - 2) 3. Select appropriate data structure of Python for solving a problem.(BL -3)		
MODULE-4	**Files, Modules and Packages**	**10 H**
Files, Modules and Packages: Files- Persistent, Text Files, Reading and Writing Files, Format Operator, Filename and Paths, Command Line Arguments, File methods, Modules- Creating Modules, Import Statement, Form.Import Statement, name spacing, Packages- Introduction to PIP, Installing Packages via PIP(Numpy).		
At the end of the Module 4, students will be able to: 1. Understand the concepts of files. (BL - 2) 2. Implement the modules and packages. (BL - 3) **3.** Organize data in the form of files. (BL - 3)		
MODULE-5	**Object Oriented Programming, Errors and Exceptions**	**9 H**
OOP in Python: Object Oriented Features, Classes, self variable, Methods, Constructors, Destructors, Inheritance, Overriding Methods, Data hiding, Polymorphism. **Error and Exceptions:**Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions.		
At the end of the Module 5, students will be able to: 1. Apply object orientation concepts.(BL -3) 2. Apply the exception handling concepts. (BL -3) 3. Implement OOPs using Python for solving real-world problems. (BL -3)		
	Total hours:	**48 Hours**

Content Beyond Syllabus: Turtle Module, GUI Programming, Matplotlib, Databases.

Self-Study:

Contents to promote self-Learning:

SNo	Module	Reference
1	Introduction to Python	https://www.youtube.com/watch?v=WvhQhj4n6b8
		https://www.youtube.com/results?search_query=History+of+Python%2C+Features+of+Python+Programming%2C+Applications+of+Python+Programming%2C+Running+Python+Scripts%2C+Comments+in+edureka
		https://www.youtube.com/watch?v=9F6zAuYtuFw
		https://www.youtube.com/watch?v=yHFcNNh-SsA
		https://www.youtube.com/watch?v=FuPHs7GLxq8
		https://www.youtube.com/watch?v=6yrsX752CWk
		https://nptel.ac.in/courses/106/106/106106145/ [Lec - 27 & 30]
		https://www.youtube.com/watch?v=0Hp7AThTZhQ
		https://www.youtube.com/watch?v=fy10ci10R_g
		https://nptel.ac.in/courses/106/106/106106145/ [Lec - 11]
		https://nptel.ac.in/courses/106/106/106106145/ [Lec - 5]
2	Operators, Expressions and Functions	https://www.youtube.com/watch?v=Pm9FOpOwhlA&t=143s
		https://nptel.ac.in/courses/106/106/106106145/ [Lec - 9]
		https://www.youtube.com/watch?v=oSPMmeaiQ68&t=51s
		https://nptel.ac.in/courses/106/106/106106145/ [Lec - 24]
3	Strings, Lists,Tuples, and Dictionaries	https://nptel.ac.in/courses/106/106/106106145/ [Lec - 6]
		https://nptel.ac.in/courses/106/106/106106145/ [Lec - 7, 12 & 23]
		https://www.youtube.com/watch?v=MEPlLAjPvXY
4	Files, Modules and Packages	https://nptel.ac.in/courses/106/106/106106145/ [Lec - 28]
5	Object Oriented Programming, Errors and Exceptions	https://nptel.ac.in/courses/106/106/106106145/ [Lec - 26, 37 & 38]

Text Book(s):

1. Python Programming: A Modern Approach,VamsiKurama, Pearson, 2017.

2. Think Python,Allen Downey, 2ndEdition,Green Tea Press

Reference Books :

1. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019.
2. Allen B. Downey, "Think Python", 2ndEdition, SPD/O'Reilly, 2016.
3. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.
4. Mark Lutz, Learning Python, 5th Edition, Orielly, 2013.
5. Wesley J Chun, Core Python Programming, 2nd Edition, Pearson, 2007
6. Kenneth A. Lambert, Fundamentals of Python, 1st Edition, Cengage Learning, 2015

Online Resources / Web Resources:

1. https://www.datacamp.com/learn-python-with-anaconda/
2. https://www.codecademy.com/learn/paths/data-science?
3. https://www.coursera.org/courses?query=python
4. https://www.edx.org/learn/python
5. https://www.w3schools.com/python/
6. https://www.javatpoint.com/python-tutorial
7. https://www.geeksforgeeks.org/python-programming-language/
8. https://www.learnpython.org/
9. https://docs.python.org/3/
10. Python - Simplilearn: https://www.youtube.com/playlist?list=PLEiEAq2VkUUKoW1o-A-VEmkoGKSC26i_I
11. Python - edureka: https://www.youtube.com/playlist?list=PL9ooVrP1hQOHY-BeYrKHDrHKphsJOyRyu
12. Python Notes for Professionals book : https://books.goalkicker.com/PythonBook/

NARAYANA ENGINEERING COLLEGE::NELLORE							
21MC104	DATABASE MANGEMENT SYSTEMS						R21
Semester	Hours / Week			Total hrs	Credit	Max Marks	
	L	T	P		C	CIE	SEE	TOTAL
I	3	0	0	48	3	40	60	100

Pre-requisite: Knowledge of File Structures, Data Structures

Course Objectives:

1. To teach the role of database management system in an organization.
2. To design databases using data modeling and Logical database designtechniques.
3. To construct database queries using relational algebra and calculus andSQL.
4. To explore implementation issues in database transaction.
5. To familiarize database security mechanisms.

Course Outcomes: On successful completion of the course, the student will be able to:

CO 1	Describe database technologies and database design.**(BL-2)**
CO 2	Demonstrate Relational Database Management Systems.**(BL-2)**
CO 3	Construct queries, procedures for database creation in RDBMS.**(BL-3)**
CO 4	Apply normalization on database design and Demonstrate transaction management.**(BL-3)**
CO 5	Demonstrate concurrency control techniques and techniques for database recovery and indexing.**(BL-2)**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	3	1									2	1
CO2	3	3											1	
CO3	2	3	3	3									3	1
CO4	2	3	3	3									3	1
CO5	2	3		1									1	

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	Introduction to Database concepts and Modeling	9H

Introduction to Data bases, Purpose of Database Systems, View of Data, Data Models, Database Languages, Database Users, Database Systems architecture.Overview of Database Design, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Conceptual Design with the ER Model.

At the end of the Module 1, students will be able to:

1. Understand the Purpose of Database Systems, Data Models, and View of Data.**(BL-2)**
2. Summarize the concept of Database Languages, Users and Architecture. **(BL-2)**
3. Design ER diagrams for given database. **(BL-2)**

4. Explain conceptual design for enterprise systems **(BL-2)**

MODULE – 2	**Relational Model, Relational Algebra**	**9H**

Introduction to the Relational Model – Integrity Constraints over Relations, Enforcing Integrity constraints, querying relational data, Logical data base Design, Views. Introduction to Relational algebra, selection and projection, set operations, renaming, joins, division.

At the end of the Module 2, students will be able to:

1. Understand Basics of Relational Model. **(BL-2)**
2. Describe phases of Logical Database Design**.(BL-2)**
3. Explain the relational algebra operations on relations**. (BL-2)**

MODULE – 3	**SQL**	**8H**

SQL: Basic form of SQL Query, DDL, DML, Views in SQL, Joins, Nested & Correlated queries, Operators, Aggregate Functions, integrity and security, Functions & Procedures, Packages, Triggers, Cursors, PL/SQL principles and examples.

At the end of the Module 3, students will be able to:

1. Construct SQL queries in RDBMS. **(BL-3)**
2. Understand integrity and security Constraints in SQL **(BL-2)**
3. Construct PL/SQL programs in RDBMS. **(BL-3)**

MODULE – 4	**Normalization&Transaction Management**	**11H**

Introduction, Functional Dependencies (FDs), Normalization for relational databases: 1NF, 2NF,3NF and BCNF, Basic definitions of Multi Valued Dependencies, 4NF and 5NF.Transaction processing, Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions.

At the end of the Module 4, students will be able to:

1. Analyze functional dependencies. **(BL-3)**
2. Apply normal forms on functional dependencies. **(BL-3)**
3. Understand Atomicity and Durability, Concurrent Executions**. (BL-2)**

MODULE – 5	**Concurrency Control&Recovery and Indexing**	**11H**

Lock-Based Protocols, Timestamp- Based Protocols, Validation-Based Protocols, Multiple Granularity.Failure Classification, Recovery and Atomicity, Log-Based Recovery.Introduction to Index data structures, Hash-Based, Tree Based Indexing.

At the end of the Module 5, students will be able to:

1. Discuss the Concurrency Control and various Protocols**. (BL-2)**
2. Understand reasons for system failures. **(BL-2)**
3. Understand Ordered Indices, B+ Tree Index Files. **(BL-2)**

	Total hours:	**48 Hours**

Content beyond syllabus:

1. Embedded SQL
2. Client/Server Database environment
3. Web Database environment

Self-Study:

Contents to promote self-Learning:

S.No	Module	Reference
1	Introduction to Database concepts and Modelling	https://nptel.ac.in/courses/106/105/106105175/ Week 1 – Lecture 1,2 https://nptel.ac.in/courses/106/105/106105175/ Week 1 – Lecture 3,4
2	Relational Model, Relational Algebra	https://nptel.ac.in/courses/106/106/106106220/ Week-3
3	SQL	https://nptel.ac.in/courses/106/105/106105175/ Week 3 – Lecture 6,7,8,9,10
4	Normalization&Transaction Management	https://nptel.ac.in/courses/106/105/106105175/ Week 4 – Lecture 31,32,33,34,35
5	Concurrency Control, Recovery, Indexing	https://nptel.ac.in/courses/106/105/106105175/ Week 6 – Lecture 6,7,8,9,10 https://nptel.ac.in/courses/106/105/106105175/ Week 7 – Lecture 26,27,28,29,30

Text Book(s):

1. Database System Concepts, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 6th Edition, Tata McGraw-Hill Publishing Company,2017.
2. Database Management System, Raghu Ramakrishnan, 3rd Edition, Tata McGraw-Hill Publishing Company, 2014.

Reference Book(s):

1. Peter Rob, A.Ananda Rao, Corlos Coronel, Database Management Systems (for JNTU), Cengage Learning, 2011.
2. Hector Garcia Molina, Jeffrey D. Ullman, Jennifer Widom, Database System Implementation, 1st Edition, Pearson Education, United States, 2000.
3. E. Ramez and Navathe, Fundamental of Database Systems, 7th Edition, Pearson Education
4. R.P. Mahapatra & Govind Verma, Database Management Systems, Khanna Publishing House, 2016.
5. Carlos Coronel and Steven Morris, Database Systems: Design, Implementation, and Management, 12th edition, Cengage Learning,2016.

Web Resources:

1. http://www.w3schools.in/dbms/
2. https://www.geeksforgeeks.org/dbms/
3. https://www.javatpoint.com/dbms-tutorial

Online compilers:

1. https://www.tutorialspoint.com/execute_sql_online.php
2. https://sqliteonline.com/

NARAYANA ENGINEERING COLLEGE:NELLORE								
21MC105	OPERATING SYSTEMS							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	3	0	0	48	3	40	60	100

Pre-requisite: Fundamentals of computers

Course Objectives:

1. To understand the fundamental principles of the operating system, its services and Functionalities.
2. To illustrate the concepts of inter-processcommunication, synchronization and scheduling.
3. To understand different types of memory management viz. virtual memory, paging and segmentation.
4. To identify the reasons for deadlock and understand the techniques for deadlock detection, prevention and recovery.
5. To understand the need of Mass storage and protection mechanisms in computer systems.

Course Outcomes: After successful completion of the course,Student will be ableto:

CO 1	Describe the concept operating system and operating system design. (BL-2)
CO 2	Analyze Process and CPU Scheduling, Process Coordination with concurrencies. (BL-3)
CO 3	Identify and evaluate Memory Management and Virtual Memory. (BL-3)
CO 4	Organize File System Interface. (BL-3)
CO 5	Understand Mass Storage Structure and Protection Mechanism. (BL-2)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	2	2									2	
CO2		2	2	1										
CO3	3	1	2	1	1								1	
CO4	1	2	1		1									
CO5	3	2	1		2								2	

1: Low, 2-Medium, 3- High

COURSE CONTENT		
MODULE – 1	**Introduction**	**9H**

Operating systems objectives and functions: Computer system architecture, operating systems structure, operating systems operations; Evolution of operating systems: Simple

Batch, multi programmed, time shared, parallel distributed systems, real time systems, special purpose systems, operating system services, user operating systems interface. **Systems calls:** Types of systems calls, system programs, protection and security, operating system design and implementation, operating systems structure**.**		
At the end of the Module 1, students will be able to: 1. Illustrate the structure of operating system and basic architectural components involved in operating system design. (BL-2) 2. Demonstrate how the computing resources are managed by the operating system. (BL-2) 3. Explain the objectives and functions of operating systems. (BL-2)		
MODULE -2	**Process and CPU scheduling, process coordination**	**10H**
Process concepts: The process, process state, process control block, threads; Process scheduling: Scheduling queues, context switch, preemptive scheduling, dispatcher, scheduling criteria, scheduling algorithms. **Thread scheduling**: Process synchronization, the critical section problem, synchronization hardware, semaphores and classic problems of synchronization, monitor. **System model**: Deadlock characterization, methods of handling deadlocks, deadlock prevention, dead lock avoidance, dead lock detection and recovery from deadlock**.**		
At the end of the Module 2, students will be able to: 1. Contrast the process and a thread. (BL-2) 2. Develop applications to run in parallel either using process or thread models of different operating system. (BL-3) 3. Illustrate the various resource management techniques for timesharing and distributed systems. (BL-2) 4. Describe deadlock and deadlock mechanisms.(BL-2)		
MODULE-3	**Memory management and virtual memory**	**10H**
Logical and physical address space: Swapping, contiguous memory allocation, paging, structure of page table. **Segmentation:** Segmentation with paging, virtual memory, demand paging; Performance of demand paging: Page replacement, page replacement algorithms, allocation of frames, thrashing**.**		
At the end of the Module 3, students will be able to: 1. Demonstrate the virtual memory, entities and attributes. (BL-3) 2. Illustrate the mapping from virtual memory address to physical address and vice-versa. (BL-3) 3. Identify how a shared memory area can be implemented using virtual memory addresses in different processes. (BL-3) 4. Contrast between Paging and Segmentation. (BL-2)		
MODULE-4	**File system interface**	**9H**

File system: The concept of a file, access methods, directory structure, file system mounting, file sharing, protection, file system structure. **File system implementation:** File system structure, File system implementation, directory implementation, allocation methods, free space management**.**		
At the end of the Module 4, students will be able to: 1. List the mechanisms adopted for file distribution in applications. (BL-1) 2. Explain the need of memory management in operating systems and understand the limits of fixed memory allocation schemes. (BL-2) 3. Organize file management when designing or developing a new operating system. (BL-3)		
MODULE-5	**Mass-storage structure**	**10H**
Mass Storage Structure: Overview of mass storage structure, Disk structure, Disk attachment, Disk scheduling, Disk management, Swap space management, RAID structure, Stable storage implementation**.** **Protection:** goals of protection, principles of protection, domain of protection, access matrix, implementation of access matrix		
At the end of the Module 5, students will be able to: 1. Illustrate the fragmentation in dynamic memory allocation, and identify dynamic allocation approaches.(BL-2) 2. Illustrate how program memory addresses relate to physical memory addresses, memory management in base-limit machines, and swapping.(BL-2) 3. Compare RAID levels of memory.(BL-2) 4. Illustrate various disk scheduling algorithms.(BL-2) 5. Understand the access control and protection mechanisms. (BL-2)		
	Total hours:	**48 hours**

Content beyond syllabus:

Linux operating systems, Multiprocessor management systems, Unix features, real time operating systems, modern operating systems.

Self-Study:

Contents to promote self-Learning:

SNo	Module	Reference
1	Introduction	https://nptel.ac.in/courses/106/105/106105214/ (week 1- lecture 1-5) https://www.udemy.com/course/operating-system-introduction/
2	Process and CPU scheduling, process coordination & Deadlocks	https://nptel.ac.in/courses/106/105/106105214/ (week 6- lecture 26-28) https://www.digimat.in/cgi-bin/search.cgi (lecture 18- lecture 23) https://nptel.ac.in/courses/106/105/106105214/ (week 8- lecture 36-4

3	Memory management and virtual memory	https://nptel.ac.in/courses/106/105/106105214/ (week 9- lecture 41-45) https://www.digimat.in/nptel/courses/video/106106144/L10.html https://www.udemy.com/tutorial/operatingsystems/how-cpu-executes-a-process-in-contiguous-allocation/
4	File system interface	https://nptel.ac.in/courses/106/105/106105214/ (week 12- lecture 57-60) https://www.udemy.com/course/operating-systems-computer-science-course/
5	Mass-storage structure and protection	https://nptel.ac.in/courses/106/105/106105214/ (week 12- lecture 57-60) https://www.digimat.in/nptel/courses/video/106102132/L31.html https://www.digimat.in/nptel/courses/video/106102132/L36.html https://www.udemy.com/course/operating-systems-online-course/

Text Book(s):

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Principles",10th Edition, Wiley Student Edition, 2018.
2. William Stallings, "Operating System- Internals and Design Principles", 6th Edition, Pearson Education, 2002.

Reference Book(s):

1. D. M. Dhamdhere, "Operating Systems a Concept based Approach", 2nd Edition, Tata McGraw-Hill, 2006.
2. P.C.P. Bhatt, "An Introduction to Operating Systems", PHI Publishers.
3. G. Nutt, N. Chaki and S. Neogy, "Operating Systems", Third Edition, Pearson Education.
4. Andrew S Tanenbaum, "Modern Operating Systems", 3rd Edition, PHI, 2007.

Online Resources/ Web References:

1. https://nptel.ac.in/courses/106/106/106106144/
2. https://www.udacity.com/course/introduction-to-operating-systems--ud923
3. https://www.javatpoint.com/os-tutorial
4. https://www.tutorialspoint.com/operating_system/index.htm
5. https://learn.saylor.org/course/view.php?id=94
6. https://swayam.gov.in/nd1_noc20_cs75/preview

NARAYANA ENGINEERING COLLEGE:NELLORE								
21MC106	COMPUTER ORGANIZATION AND ARCHITECTURE							R 21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	3	0	0	48	3	40	60	100

Pre-requisite: Nil

Course Objectives:

1. To understand basic components of system.
2. To understand number representation.
3. To understand the concepts of computer architecture.
4. To understand the concepts of memory organization.
5. To understand the system interconnection and the different I/O techniques.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	Analyze how the functional units of a computer operate, interact, and communicate .**(BL-4)**
CO 2	Identifythe representation of numbers and perform arithmetic operations.**(BL-3)**
CO 3	Interpret the functional architecture of computing system.**(BL-2)**
CO 4	Define a logic for assembly language programming.**(BL-1)**
CO 5	Analyze the memory organization of computer system.**(BL-4)**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	1										1	1
CO2	1	3	2										1	2
CO3	3	1	2		1								2	1
CO4	2	3	1	2									1	2
CO5	2	3	1										2	1

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	Introduction of computer architecture	10 H

Basic Structure of Computer: Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Performance, Multiprocessors and Multicomputer, Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations, Stacks and Queues, Subroutines.

At the end of the Module 1, students will be able to:

1. **Understand** the basic functional units and the ways they are interconnected to form a computer system. .**(BL - 2)**
2. **Illustrate** various addressing modes for accessing register and memory operands. .**(BL - 2)**
3. **Describe** the instruction sequencing and various types of instructions.**(BL - 2)**

MODULE -2	Data representation and computer Arithmetic	9 H

Fixed point representation of numbers: Algorithms for arithmetic operations, multiplication: Booths, Modified Booths, division: restoring and non-restoring. **Floating point representation:** IEEE standards and algorithms for common arithmetic operations, Representation of character codes.

At the end of the Module 2, students will be able to:

1. **Identify** Various Number systems. .**(BL - 3)**
2. **Analyze** the arithmetic operation**. (BL-4)**
3. **Conversion** of Binary codes. **(BL-4)**

MODULE-3	Concepts of Computer Architecture	9 H

Introduction to ISA (Instruction Set Architecture): Machine Instruction Characteristics, Types of operands, Instruction formats, Instruction types and addressing modes. **Basic Processing Unit:** Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hardwired Control, Micro programmed Control.

At the end of the Module 3, students will be able to:

4. **illustrate** various instruction formats. **(BL-2)**
5. **Demonstrate** execution of complete instruction. **(BL-2)**
6. **Apply** basic binary math operations and micro programmed control in computers.**(BL-3)**

MODULE-4	Memory Organization	10 H

Basic concepts, Semiconductor RAM memories, Read only memories, speed, size and cost, Cache memories, performance considerations, Virtual memory, Memory management requirements, Secondary storage. Forms of Parallel Processing, Array Processors, The Structure of General-Purpose multiprocessors, Interconnection Networks, Data&Instruction Hazards

At the end of the Module 4, students will be able to:

1. **Analyze** the organization of various parts of a system memory hierarchy. **(BL-4)**
2. **Analyze** the structure of general-Purpose multiprocessors. **(BL-4)**
3. **Identify** various Instruction Hazards. **(BL-3)**

MODULE-5	Input/output Organization	10 H

I/O Basics: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access (DMA).**Buses:** Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface, Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB).

At the end of the Module 5, students will be able to:

1. **Describe** IO interface. **(BL-42)**
2. **Distinguish** between Synchronous &Asynchronous Bus. **(BL-4)**
3. **Analyze** the DMA transfer. **(BL-4)**

Total hours:	**48 hours**

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	**Introduction of computer architecture**	CO1	https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/
2	**Data representation and computer Arithmetic**	CO2	https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/ https://www3.ntu.edu.sg/home/ehchua/programming/java/d

			atarepresentation.html
3	**Concepts of Computer Architecture**	CO3	https://www.geeksforgeeks.org/microarchitecture-and-instruction-set-architecture/https://www.studytonight.com/computer-architecture/memory-organization
4	**Memory Organization**	CO4	https://www.studytonight.com/computer-architecture/memory-organization
5	**Input/Output Organization**	CO5	https://www.geeksforgeeks.org/io-interface-interrupt-dma-mode/ https://www.studytonight.com/computer-architecture/input-output-organisation

Text Book(s):

1. "Computer Organization", Carl Hamacher, ZvonkoVranesic, SafwatZaky, 5th Edition, McGraw Hill Education, 2013.
2. Computer Organization and Design-The Hardware/Software Interface , David A. Patterson and John L. Hennessy 5th edition, Morgan Kaufmann, 2013.

Reference Book(s):

1. Mano M. M., Digital Logic & Computer Design, 4/e, Pearson Education, 2013.
2. W. Stallings, Computer organization and architecture, 8th edition, Prentice-Hall, 2013.
3. Patterson D.A. and J. L. Hennessey, Computer Organization and Design, 5/e, Morgan Kauffmann Publishers, 2013.
4. William Stallings, Computer Organization and Architecture: Designing for Performance, 9/e, Pearson, 2013.
5. Chaudhuri P., Computer Organization and Design, 2/e, Prentice Hall, 2008.

Online resources/Web References:

1. www.frortechbooks.com/computer-organization-and-architecturef56.com
2. https://www.pdfdrive.com/computer-organization-books.html
3. https://www.tutorialspoint.com/computer_organization/index.asp
4. https://www.geeksforgeeks.org/computer-organization-and-architecturetutorials
5. https://nptel.ac.in/courses/106/105/106105163/
6. https://www.javatpoint.com/computer-organization-and-architecture-tutorial

COMMUNICATION LAB
(21MC107)

Semester	H / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	1	2	48	2	40	60	100

CO – 1: To understand the communication concepts and to develop the students' competence in communication at an advanced level

CO – 2: To participate in Team activities that leads to the development of collaborative work skills

CO – 3: To develop strategies appropriately to improve Listening skills and Spoken Skills

CO – 4: To provide the knowledge on Presentation Skills, Group Discussion, Interview Skills and Resume Writing

CO – 5: To improve skills to write resume, cover letter and Technical report

TASK – 1

Class Room : Introduction – Objectives & Characteristics of Technical Communication – Importance and need for Technical communication.

Practice-1 : Ice - Breaking Activity, Introducing Oneself and Others – Greetings – Taking Leave

TASK – 2

Class Room : Verbal& Non Verbal Communication - Interpersonal Communication in/with Groups – Barriers to effective Communication – Public Speaking Skills - Poster Presentation

Practice-2 : Role Plays – Just a Minute (JAM) – Conversation Practice

Practice-3 : Oral Description of Pictures, Photographs, Products, and Process – Poster Presentation

TASK – 3

Class Room : Listening Skills - Types of Listening Skills- Active listening and anticipating the speaker

Practice-4 : Listening for Specific & General Details- Listening Comprehension

TASK – 4

Class Room : Reading Skills: Skimming, Scanning, Intensive & Extensive reading **–** Debate : How to Debate, Tips for Debate, Debate Practice, Explanation of Debate Techniques, Debate Videos Presentation

Practice-5 : Debate (Planned & Extempore)

Practice-6: Reading comprehension- Skimming, Scanning, Intensive & Extensive reading

TASK – 5

Class Room : Scientific and Technical writing; Formal and Informal writing – Abstract Writing – Technical Report Writing– Resume Writing: Cover Letter, Resume Preparation

Practice-7 : Technical Report Writing

Practice-8 : Resume Writing

TASK – 6

Class Room : Presentation Skills Presentation techniques-tips of how to be an effective presenter-Preparation — how to deal with fear and anxiety - Voice, pace and gesture — how to speak, stand and move. Getting live feedback — how to interact with the audience
Practice-9 : Technical Report Writing
Practice-10 : Resume Writing

TASK – 7

Class Room : Group Discussion: What is Group Discussion, Types of Group Discussion, Tips and Techniques for Effective Group Discussion, Group Discussion Videos Presentation – Interview Skills : Interview strategies, Interview questions, Successful Interview presentations
Practice-11 : Group Discussion (Planning & Extempore)
Practice-12 : Mock Interviews

Text Book(s):

1. Technical Communication: Principles and Practice by Meenakshi Raman&Sangeeta Sharma, OxfordUniversityPress.

Reference Books:

1. Effective Technical Communication by M. Ashraf Rizvi, Tata McGraw-Hill Publishing Company Ltd. 2005.
2. English Language Communication: A Reader cum Lab Manual byAnuradha Publications, Chennai, 2006. 4. Dr. ShaliniVerma, “Body Language- Your Success Mantra”, S. Chand, 2006.
3. Business Communication today by Bovee, Till and Schatzman, Pearson

Software :

1. Walden ELCS&AECS Lab
2. English In Mind (EIM) all level by Cambridge University
3. Cambridge Pronunciation Dictionary by Cambridge University
4. Oxford Advanced Learners Dictionary, Oxford University

WebResources:

- *Grammar/Listening/Writing1-language.com*
- *http://www.5minuteenglish.com/*
- *https://www.englishpractice.com/Grammar/Vocabulary*
- *EnglishLanguageLearning Online*
- *http://www.bbc.co.uk/learningenglish/*
- *http://www.better-english.com/*
- *http://www.nonstopenglish.com/*
- *https://www.vocabulary.com/*
- *BBCVocabularyGames*
- *FreeRiceVocabulary GameReading*

- *https://www.usingenglish.com/comprehension/*
- *https://www.englishclub.com/reading/short-stories.htm*
- *https://www.english-online.at/Listening*
- *https://learningenglish.voanews.com/z/3613*
- *http://www.englishmedialab.com/listening.htmlSpeaking*
- *https://www.talkenglish.com/*
- *BBCLearningEnglish–Pronunciationtips*
- *Merriam-Webster–PerfectpronunciationExercisesAllSkills*
- *https://www.englishclub.com/*
- *http://www.world-english.org/*
- *http://learnenglish.britishcouncil.org/*

OnlineDictionaries

- *Cambridgedictionaryonline:https://dictionary.cambridge.org/*
- *MacMillandictionary:https://www.macmillandictionary.com/*

Oxfordlearner'sdictionaries:https://www.oxfordlearnersdictionaries.com/

NARAYANA ENGINEERING COLLEGE::NELLORE								
21MC108	PROBLEM SOLVING THROUGH C LAB							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	0	3	48	1.5	40	60	100

Pre-requisite: Mathematics Knowledge, Analytical & Logical Skills

Course Objectives:

1. To work with the compound data types
2. To explore dynamic memory allocation concepts
3. To design the flowchart and algorithm for real world problems
4. To write C programs for real world problems using simple and compound data types
5. To employee good programming style, standards and practices during program development

Course Outcomes: After successful completion of the course, Student will be able to:

CO 1	Translate algorithms into programs (In C language) **(BL - 2)**
CO 2	Code and debug programs in C program language using various constructs. **(BL- 3)**
CO 3	Solve the problems and implement algorithms in C. **(BL - 3)**
CO 4	Make use of different data types to handle the real time data **(BL - 3)**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2											1	
CO2	2	2	2										2	1
CO3	2	2	3	1	2								2	2
CO4	2	2	3	1	1								2	2

1: Low, 2-Medium, 3- High

COURSE CONTENT	CO
TASK-1 (3H)	
1. Practice DOS and LINUX Commands necessary for execution of C Programs. 2. Study of the Editors, Integrated development environments, and Compilers in chosen platform. 3. Write, Edit, Debug, Compile and Execute Sample C programs to understand the programming environment.	CO 1
TASK-2 (3H)	
Practice programs: Finding the sum of three numbers, exchange of two numbers, largest of two numbers, to find the size of data types, Programs on precedence and associativity of operators, sample programs on various library functions.	CO 1

TASK-3 (6H)	
1. Write a program to find the roots of a Quadratic equation. 2. Write a C program to calculate the factorial of a given positive integer. 3. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 & 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.	CO1
TASK-4 (6H)	
1. Write a C program to find the sum of individual digits of a positive integer. 2. Write a program to reverse the digits of a number. 3. Write a program to generate the series of prime numbers in the given range. 4. Write a program to check for number palindrome.	CO 2
TASK-5 (6H)	
1. Write a C program for the following that use both recursive & non-recursive functions: a. To calculate the factorial of a given positive integer. b. To find the greatest common divisor of two given integers. c. To generate Fibonacci series. 2. Illustrate the use of auto, static, register and external variables.	CO 2
TASK-6 (3H)	
1. Write a program to find the sum of positive and negative numbers in a given set of numbers. 2. Write C code to reverse the elements of the array. For example, [1,2,3,4,5]should become [5,4,3,2,1] 3. Write a program to find the maximum of a set of numbers.	CO 3
TASK-7 (6H)	
1. Write a C program to find addition of two matrices 2. Write a C program to find multiplication of two matrices	CO 3
TASK-8 (3H)	
1. Write a program to accept a line of characters and print the number of vowels, consonants, blank spaces, digits and special characters. 2. Write a C program to check whether a given string is a palindrome or not, withoutusing any built-in functions.	CO 3
TASK-9 (6H)	
1. Write a C program to find the length of a given string using pointers. 2. Write a C program to add two distances in feet and inches using structure 3. Write a C program to read and print an employee's detail using structure 4. Write a C program to read and print book information using union	CO 4
TASK-10 (6H)	
1. Write a program to split a "file" into two files, say file1 and file2. Write linesintothe 'file' from standard input. Read the contents from 'file' and write odd numbered lines into file1 and even numbered lines into file2. 2. Write a program to merge two files.	CO 4

Additional Experiments:	
TASK-1	
1. Programs on bitwise operators. 2. Programs on bit fields, typedef, and enumeration	CO4
TASK-2	
1. Write a program to read a set of strings and sort them in alphabetical order. 2. Programs on implementation of structures using files.	CO 4

Virtual Labs:

1. Problem Solving Lab (IIIT HYDERABAD) : http://ps-iiith.vlabs.ac.in/

List of Experiments

1. Numerical Representation	6. Recursion
2. Beauty of Numbers	7. Advanced Arithmetic
3. More on Numbers	8. Searching and Sorting
4. Factorials	9. Permutation
5. String Operations	10. Sequences

2. Computer Programming Lab (IIIT HYDERABAD) : http://cse02-iiith.vlabs.ac.in/

List of Experiments

1. Numerical Approximation	6. Basic Control Flow
2. Functions	7. Pointers
3. Advanced Control Flow	8. Recursion
4. Arrays	9. Expression Evaluation
5. Structures	

Text Book(s):

1. Pradip Dey, and Manas Ghosh, "Programming in C", 2018, Oxford University Press.
2. Byron Gottfried, Schaum's Outline of Programming with C, 4th Edition, 2018, McGraw-Hill.

Reference Book(s):

1. "The C Programming Language", Brian W. Kernighan, Dennis M. Ritchie, 2nd Edition, Pearson.
2. "Let us C", Yeswant Kanetkar, BPB publications
3. "Pointers in C", Yeswant Kanetkar, BPB publications, 16th Edition, 2017
4. Computer Science, A Structured Programming Approach Using C by Behrouz A.
5. Forouzan& Richard F. Gilberg, 3rd Edition, Cengage Learning
6. C Programming A Problem-Solving Approach, Behrouz A. Forouzan & E.V. Prasad, F. Gilberg, 3rd Edition, Cengage Learning
7. Programming with C RemaTheraja, Oxford, 2018
8. Programming in C, 3rd Edition, 2015, Ashok N. Kamthane, Pearson Education
9. Programming in C, 3/e : A Practical Approach by Ajay Mittal, Pearson Publication
10. Problem Solving with C by Somashekara, M. T., Guru, D. S., Manjunatha, K. S.,

PHI Learning, 2nd Edition, 2018
11. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press, 2001
12. Byron Gottfried, Schaum's Outline of Programming with C, 4th Edition, 2018, McGraw-Hill

Web Resources:

1. https://www.includehelp.com/c-programs/advacnce-c-examples.aspx
2. https://www.programiz.com/c-programming/examples
3. https://www.javatpoint.com/c-programs
4. https://www.w3resource.com/c-programming-exercises/
5. https://www.sanfoundry.com/simple-c-programs/
6. https://www.includehelp.com/c-programming-examples-solved-c-programs.aspx
7. http://www.c4learn.com/c-programs/tag/c-programs-typical-programs

NARAYANA ENGINEERING COLLEGE:NELLORE								
21MC109	PYTHON PROGRAMMING LAB							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	0	3	48	1.5	40	60	100

Pre-requisite: Programming Knowledge

Course Objectives:

1. To gain knowledge on python programs basics
2. To prepare students for solving the programs on functions, data structures, Files
3. To prepare students for solving the programs on Classes, Exception Handiling, Regular Expressions and Multi threading

Course Outcomes: After successful completion of the course, the student will be able to:

CO1	Understanding and use of python- Basic Concepts**(BL -2)**
CO2	Solve the concepts of python functions and data structures**(BL -3)**
CO3	Understand the concepts of files, modules, multithreading and regular expressions **(BL -2)**
CO4	Solve the concepts of class and exception handling **(BL -3)**

CO-PO Mapping

CO	PO												PSO	
	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	1	1	2										1	
CO2	2	3	2	2									2	1
CO3	2	2	3	2	2								3	2
CO4	2	2	2	1	1								3	2

1-Low, 2-Medium, 3- High

COURSE CONTENT	CO
Task-1 - Python Basics (4 H)	
1. Running instructions in Interactive interpreter and a Python Script 2. Write a program to purposefully raise Indentation Error and Correct it 3. Write a program to compute distance between two points taking input from the user (Pythagorean Theorem) 4. Write a program to convert a Binary number to Decimal number and verify if it is a Perfect number.	CO 1
Task-2 - Conditional Statements (2 H)	
1. Write a program to determine if a given string is a Palindrome or not 2. Write a program for Fibonacci sequence is generated by adding the previous two terms by starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...	CO 1
Task-3 - Functions (2 H)	
1. Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding. Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius. If	CO 2

(distance between two balls centers) <= (sum of their radii) then (they are colliding)	
TASK-4 - Functions Continued (2 H)	
1. Write a function that draws a Pyramid with # symbols # # # # # # # # # # # # # # # # 2. Choose any five built-in string functions of C language. Implement them on your own in Python. You should not use string related Python built-in functions.	CO 2
TASK-5 - Strings(4 H)	
1. Write a program to use split and join methods in the string and trace a birthday with Dictionary data structure. 2. Write a program using map, filter and reduce functions	CO 2
TASK-6 - Lists (4 H)	
1. Write program which performs the following operations on list's. Don't use built-in functions a) Updating elements of a list b) Concatenation of list's c) Check for member in the list d) Insert into the list e) Sum the elements of the list f) Push and pop element of list g) Sorting of list h) Finding biggest and smallest elements in the list i) Finding common elements in the list	CO 2
TASK-7 - Files (4 H)	
1. Write a program to print each line of a file and count the number of characters, words and lines in a file. 2. Write a program that allows you to replace words, insert words and delete words from the file.	CO 3
TASK-8 - Modules and Packages (2 H)	
1. Write a program for creating a module and import a module 2. Write a program to perform any two operations using Numpy	CO 3
TASK-9-Class and Objects (4 H)	
1. Write a Python class to find validity of a string of parentheses, '(', ')', '{', '}', '[' and ']. These brackets must be close in the correct order, for example "()" and "()[]{}" are valid but "[)", "({[)]" and "{{{" are invalid 2. Write a Python class to get all possible unique subsets from a set of distinct integers. Input : [4, 5, 6] Output : [[], [6], [5], [5, 6], [4], [4, 6], [4, 5], [4, 5, 6]]	CO 4

TASK-10 - Exception Handiling (4 H)	
1. Write a program of exception handling to open a file while do not have write permissions 2. Write a Programto handle multiple errors with one except statement.	CO 4

Additional Experiments:	
TASK-1	
1. Write a python programs on lists 2. Write a python program on strings 3. Write a python program on tuples	

Virtual Labs:	
Python Lab (IIT Bombay) : http://vlabs.iitb.ac.in/vlabs-dev/labs/python-basics/experimentlist.html	
List of Experiments	
1. Arithmetic Operations 2. Built-in Functions 3. Loops 4. Data Types 5. Strings	6. Classes and Objects 7. Built-in Modules 8. Constructors and Inheritance 9. File Operators

Text Book(s):

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson, 2017
2. Learning Python, Mark Lutz, Orielly, 5th Edition, 2013

Reference Book(s):

1. Think Python, Allen Downey, Green Tea Press, 2nd Edition
2. Core Python Programming, W.Chun, Pearson, 2nd Edition, 2007
3. Fundamentals of Python, Kenneth A. Lambert, Cengage Learning, 1st Edition, 2015
4. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019
5. Allen B. Downey, "Think Python", 2ndEdition, SPD/O'Reilly, 2016
6. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.
7. Michael Dawson, —Python Programming for absolute beginners, 3rd Edition, CENGAGE Learning Publications, 2018.
8. Taming Python by Programming, Jeeva Jose,Khanna Publishing House, 1st Edition, 2018
9. Introduction to Computing and Problem Solving with Python, J. Jose, Khanna Publications, 1st Edition, 2019.
10. Guido Van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

Web References:

1. https://www.tutorialspoint.com/python/index.htm
2. https://www.w3schools.com/python/
3. https://www.javatpoint.com/python-tutorial
4. https://www.geeksforgeeks.org/python-programming-language/

NARAYANA ENGINEERING COLLEGE::NELLORE								
21MC110	DATABASE MANGEMENT SYSTEMS LAB							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	0	3	48	1.5	40	60	100

Pre-requisite: Knowledge of Computer Programming, Data Structures and Algorithms

Course Objectives:

1. To populate and query a database using SQL DDL/DML Commands.
2. To design real-world entities with Entity-Relationship diagrams.
3. To apply integrity constraints over relational databases.
4. To construct queries using advanced concepts of SQL
5. To demonstrate programs in PL/SQL

Course Outcomes: After successful completion of the course, Student will be able to:

CO 1	Utilize SQL for creating database and performing data manipulation operations. **(BL-3)**
CO 2	Examine integrity constraints to build efficient databases. **(BL-3)**
CO 3	Build PL/SQL programs including procedures, functions, cursors and triggers. **(BL-3)**
CO 4	Apply queries using advanced database design and Normalization**. (BL-3)**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3										1	1
CO2	1	3	3										1	2
CO3	1	3	3										1	2
CO4	1	3	3	3									1	2

1: Low, 2-Medium, 3- High

COURSE CONTENT	CO
Task - 1 BASIC CONCEPTS (3H)	
1.Create a table called Employee with the following structure. **Name** **Type** Empno Number Ename Varchar2(20) Job Varchar2(20) Mgr Number Sal Number a. Add a column commission with domain to the Employee table.	CO 1

b. Insert any five records into the table.
c. Update the column details of job
d. Rename the column of Employ table using alter command.
e. Delete the employee whose empno is19.

2.Create department table with the following structure.

Name	**Type**
Deptno	Number
Deptname	Varchar2(20)
location	Varchar2(20)

a. Add column designation to the department table.
b. Insert values into the table.
c. List the records of emp table grouped by dept no.
d. Update the record where dept no is 9.
e. Delete any column data from the table

3. Create a table called Customer table

Name	**Type**
Custname	Varchar2(20)
Custstreet	Varchar2(20)
Cust city	Varchar2(20)

a. Insert records into the table.
b. Add salary column to the table.
c. Alter the table column domain.
d. Drop salary column of the customer table.
e. Delete the rows of customer table whose Cust_city is 'hyd'.
f. Create a table called branch table.

Name	**Type**
Branchname	Varchar2(20)
Branch city	Varchar2(20)
asserts	Number

4. Increase the size of data type for asserts to the branch.
a. Add and drop a column to the branch table.
b. Insert values to the table.
c. Update the branch name column
d. Delete any two columns from the table

5. Create a table called sailor table

Name	**Type**
Sid	Number
Sname	Varchar2(20)
rating	Varchar2(20)

a. Add column age to the sailor table. b. Insert values into the sailor table. c. Delete the row with rating>8. d. Update the column details of sailor. e. Insert null values into the table. 6. Create a table called reserves table **Name** **Type** Boatid Integer sid Integer day Integer a. Insert values into the reserves table. b. Add column time to the reserves table. c. Alter the column day data type to date. d. Drop the column time in the table. e. Delete the row of the table with some condition.	
Task 2 - QUERIES USING DDL AND DML(6H)	
1. a. Create a user and grant all permissions to the user. b. Insert the any three records in the employee table and use rollback. Check the result. c. Add primary key constraint and not null constraint to the employee table. d. Insert null values to the employee table and verify the result. 2. a. Create a user and grant all permissions to the user. b. Insert values in the department table and use commit. c. Add constraints like unique and not null to the department table. d. Insert repeated values and null values into the table. 3. a. Create a user and grant all permissions to the user. b. Insert values into the table and use commit. c. Delete any three records in the department table and use rollback. d. Add constraint primary key and foreign key to the table. 4. a. Create a user and grant all permissions to the user. b. Insert records in the sailor table and use commit. c. Add save point after insertion of records and verify save point. d. Add constraints not null and primary key to the sailor table. 5. a. Create a user and grant all permissions to the user. b. Use revoke command to remove user permissions. c. Change password of the user created. d. Add constraint foreign key and notnull.	CO 1

6. a. Create a user and grant all permissions to the user. b. Update the table reserves and use save point and rollback. c. Add constraint primary key, foreign key and not null to the reserves table d. Delete constraint not null to the table column	
Task -3QUERIES USING AGGREGATE FUNCTIONS(3H)	
1. a. By using the group by clause, display the names who belongs to dept no 10 along with average salary. b. Display lowest paid employee details under each department. c. Display number of employees working in each department and their department number. d. Using built in functions, display number of employees working in each department and their department name from dept table. Insert dept name to dept table and insert dept name for each row, do the required thing specified above. e. List all employees which start with either B or C. f. Display only these ename of employees where the maximum salary is greater than or equal to 5000. 2. a. Calculate the average salary for each different job. b. Show the average salary of each job excluding manager. c. Show the average salary for all departments employing more than three people. d. Display employees who earn more than thelowest salary in department 30 e. Show that value returned by sign (n)function. f. How many days between day of birth to current date 3. a. Show that two substring as single string. b. List all employee names, salary and 15% rise in salary. c. Display lowest paid emp details under each manager d. Display the average monthly salary bill for each deptno. e. Show the average salary for all departments employing more than two people. f. By using the group by clause, display the eid who belongs to dept no 05 along with average salary. 4. a. Count the number of employees in department20 b. Find the minimum salary earned by clerk. c. Find minimum, maximum, average salary of all employees. d. List the minimum and maximum salaries for each job type. e. List the employee names in descending order. f. List the employee id, names in ascending order by empid. 5. a. Find the sids, names of sailors who have reserved all boats called “INTERLAKE Find the age of youngest sailor who is eligible to vote for each rating level with at least two such sailors. b. Find the sname, bid and reservation date for each reservation.	CO2

c. Find the ages of sailors whose name begin and end with B and has at least 3characters. d. List in alphabetic order all sailors who have reserved red boat. e. Find the age of youngest sailor for each rating level. 6. a. List the Vendors who have delivered products within 6 months from orderdate. b. Display the Vendor details who have supplied both Assembled and Subparts. c. Display the Sub parts by grouping the Vendor type (Local or Non Local). d. Display the Vendor details in ascending order. e. Display the Sub part which costs more than any of the Assembled parts. f. Display the second maximum cost Assembled part	
TASK-4PROGRAMS ON PL/SQL(6H)	
a. Write a PL/SQL program to swap two numbers. b. Write a PL/SQL program to find the largest of three numbers. 2. a. Write a PL/SQL program to find the total and average of 6 subjects and displaythegrade. b. Write a PL/SQL program to find the sum of digits in a given umber. 3. a. Write a PL/SQL program to display the number in reverse order. b. Writea PL/SQLprogram to check whether the given number is prime or not. 4. a. Write a PL/SQL program to find the factorial of a given number. b. Write a PL/SQL code block to calculate the area of a circle for a value of radiusvarying from 3 to 7. Store the radius and the corresponding values of calculated area inan empty table named areas, consisting of two columns radius and area. 5. a. Write a PL/SQL program to accept a string and remove the vowels from the string.(When 'hello' passed to the program it should display 'Hll' removing e and o from theworldHello). b. Write a PL/SQL program to accept a number and a divisor. Make sure the divisor is lessthan or equal to 10. Else display an error message. Otherwise Display the remainder inwords.	CO 3
TASK-5 PROCEDURES AND FUNCTIONS(3H)	
1. Write a function to accept employee number as parameter and return Basic +HRA together as single column. 2. Accept year as parameter and write a Function to return the total net salary spent for a given year. 3. Create a function to find the factorial of a given number and hence find NCR. 4. Write a PL/SQL block to print prime Fibonacci series using local functions. 5. Create a procedure to find the lucky number of a given birth date. 6. Create function to the reverse of given number	CO 3
TASK-6 TRIGGERS(3H)	
1.Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and new values:	CO 3

CUSTOMERS table:

ID	NAME	AGE	ADDRESS	SALARY
1	Alive	24	Khammam	2000
2	Bob	27	Kadapa	3000
3	Catri	25	Guntur	4000
4	Dena	28	Hyderabad	5000
5	Eeshwar	27	Kurnool	6000
6	Farooq	28	Nellore	7000

2. Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database.
Passenger (Passport_ id INTEGER PRIMARY KEY, Name VARCHAR (50) NotNULL, Age Integer Not NULL, Sex Char, Address VARCHAR (50) NotNULL);
a. Write a Insert Trigger to check the Passport_id is exactly six digits ornot.
b. Write a trigger on passenger to display messages '1 Record is inserted', '1 record is deleted', '1 record is updated' when insertion, deletion and updation are done on passenger respectively.
3. Insert row in employee table using Triggers. Every trigger is created with name any trigger has same name must be replaced by new name. These triggers can be raised before insert, update or delete rows on data base. The main difference between a trigger and a stored procedure is that the former is attached to a table and is only fired when an INSERT, UPDATE or DELETE occurs.
4. Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert or update.
5. Trigger before deleting a record from emp table. Trigger will insert the row to be deleted into table called delete _emp and also record user who has deleted the record and date and time of delete.
6. Create a transparent audit system for a table CUST_MSTR. The system must keep track of the records that are being deleted or updated

TASK-7 BOOK PUBLISHING COMPANY(6H)

CO 3

A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing oneor more publications.

A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a particular book, each author works with on editor, but may submit another work for publication to be supervised by other editors. To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject

for the above case study, do the following: 1. Analyze the data required. 2. Normalize the attributes. 3. Create the logical data model using E-R diagrams	
TASK-8 GENERAL HOSPITAL(6H)	
A General Hospital consists of a number of specialized wards (such as Maternity, Pediatric, Oncology, etc.). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward. For the above case study, do the following. 1. Analyze the data required. 2. Normalize the attributes. Create the logical data model using E-R diagrams	CO 3
TASK -9CAR RENTAL COMPANY(6H)	
A database is to be designed for a car rental company. The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements. Therefore, the data about garages to be kept in the database includes garage names, addresses, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities. Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc. Similarly, the cash inflow coming from all sources: Car hire, car sales, insurance claims must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special credit card facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an	CO 4

estimated time of rental, unless they wish to pay by credit card. All major credit cards are accepted. Personal details such as name, address, telephone number, driving license, number about each customer are kept in the database. For the above case study, do the following: 1. Analyze the data required. 2. Normalize the attributes. Create the logical data model using E-R diagrams	
TASK -10 STUDENT PROGRESS MONITORING SYSTEM(6H)	
A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA (Hons) M.Sc., etc)within the framework of the modular system. The college provides a number of modules, each being characterized by its code, title, credit value, module leader, teaching staff and the department they come from. A module is coordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: Some modules require pre- requisites modules and some degree programs have compulsory modules. The database is also to contain some information about students including their numbers, names, addresses, degrees they read for, and their past performance i.e. modules taken and examination results. For the above case study, do the following: 1. Analyze the data required. 2. Normalize the attributes. 3. Create the logical data model i.e., ER diagrams. 4. Comprehend the data given in the case study by creating respective tables withprimary keys and foreign keys where ever required. 5. Insert values into the tables created (Be vigilant about Master- Slavetables). 6. Display the Students who have taken M.Sc course 7. Display the Module code and Number of Modules taught by each Lecturer. 8. Retrieve the Lecturer names who are not Module Leaders. 9. Display the Department name which offers ‘English’ module. 10. Retrieve the Prerequisite Courses offered by every Department (with Department names). 11. Present the Lecturer ID and Name who teaches ‘Mathematics’. 12. Discover the number of years a Module is taught. 13. List out all the Faculties who work for ‘Statistics’ Department. 14. List out the number of Modules taught by each Module Leader. 15. List out the number of Modules taught by a particular Lecturer. 16. Create a view which contains the fields of both Department and Module tables. (Hint- The fields like Module code, title, credit, Department code and its name). 17. Update the credits of all the prerequisite courses to 5. Delete the Module	CO 4

'History' from theModule table.	
Total Hours:	**48 Hours**

Additional Experiments:	
TASK -1PROCEDURES	
1. Create the procedure for palindrome of given number. 2. Create the procedure for GCD: Program should load two registers with two Numbers andthen apply the logic for GCD of two numbers. GCD of two numbers is performed bydividing the greater number by the smaller number till the remainder is zero. If it is zero,the divisor is the GCD if not the remainder and the divisors of the previous division arethe new set of two numbers. The process is repeated by dividing greater of the twonumbers by the smaller number till the remainder is zero and GCD is found. 3. Write the PL/SQL programs to create the procedure for factorial of given number. 4. Write the PL/SQL programs to create the procedure to find sum of N natural number. 5. Write the PL/SQL programs to create the procedure to find Fibonacci series. 6. Write the PL/SQL programs to create the procedure to check the given number is perfect or not	CO 1
TASK -2CURSORS	
1. Write a PL/SQL block that will display the name, dept no, salary of fist highest paidemployees**.** 2. Update the balance stock in the item master table each time a transaction takes place in the item transaction table. The change in item master table depends on the item id is already present in the item master then update operation is performed to decrease the balance stock by the quantity specified in the item transaction in case the item id is not present in the item master table then the record is inserted in the item master table. 3. Write a PL/SQL block that will display the employee details along with salary using cursors. 4. To write a Cursor to display the list of employees who are working as a Managers or Analyst. 5. To write a Cursor to find employee with given job and dept no. **6.** Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the 'employee' table are updated. If none of the employee's salary are updated, we geta message 'None of the salaries were updated'. Else we get a message like for example, 'Salaries for 1000 employees are updated' if there are 1000 rows in 'employee' table	CO 3
Virtual Labs: http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/labs/explist.php **List of Experiments with Description:**	

1. Data Definition Language(DDL) Statements: (Create table, Alter table, Drop table)
   Aim: To Understand and Implement Data Defining Language (DDL) Statements.
   Objective: To understand the various aspects of Data definition language commands like:
   Creating a table, with or without constraints.
   Understanding Data types.
   Altering the structure of the table like adding attributes at later stage, modifying size of attributes or adding constraints to attributes.
   Removing the table created, i.e Drop table in SQL.
2. Data Manipulation Language(DML) Statements
   Aim: To understand the concept of implementing Data Manipulation Language(DML) statements.
   The objective of the experiment is to understand various aspects of Data Manipulation Commands like:
   Inserting Data into the table, (inserting all attributes in a table or inserting selected attributes in a table).
   Updating Data into the table (updating all tuples in a table or updating selected tuples in a table).
   Deleting Data from the table (deleting all tuples from the table(not advisable) or deleting selected tuples from the table).
3. Data Query Language(DQL) Statements: (Select statement with operations like Where clause, Order by, Logical operators, Scalar functions and Aggregate functions)
   Aim: To understand various aspects of Data Query Language Commands like
   Displaying all the attributes and tuples from the table.
   Displaying selected attributes/tuples from the table.
   Using Logical and comparison operators.
   Using aggregate functions.
   Using Scalar functions.
   Sorting Data.
4. Transaction Control Language(TCL) statements: (Commit(make changes permanent), Rollback (undo)
   Aim:To understand and implement Transaction Control Language (TCL) Statements.
   Objective: To Provide the students a practical experience of how transactions could be made permanent in memory or how are they revoked.
5. Describe statement: To view the structure of the table created
   Aim:To understand and Implement Describe Statement which can be used to view the structure of the table created by the user.
   Procedure:
   The Describe command is used to view the structure of the table created.
   To use the describe statement , you should have at least one table in your schema.
   The syntax for describe is desc<table_name>
   Example : If you would like to view Employee table, then Desc emp;
   Write Query in the Query Editor and click on Execute Query button.
   If you are existing user and want to save/restore your data, use Credentials.

Text Book(s):

1. A.Silberschatz, H.F.Korth, S.Sudarshan, “Database System Concepts”, 6/e, TMH 2019
2. Raghurama Krishnan, Johannes Gehrke, “Database Management Systems”, 3/e, TMH

Reference Book(s):

1. RamezElmasri, Shamkant, B. Navathe, “Database Systems”, Pearson Education, 6/e, 2013.
2. Peter Rob, Carles Coronel, “Database System Concepts”, Cengage Learning, 7/e,2008.Rick F Vander Lans, “Introduction to SQL”, 4/e, Pearson Education, 2007
3. Nilesh Shah, "Database Systems Using Oracle”, PHI, 2007

Web Resources:

4. http://www.w3schools.in/dbms/
5. https://www.geeksforgeeks.org/dbms/
6. https://www.javatpoint.com/dbms-tutorial

Online compilers:

3. https://www.tutorialspoint.com/execute_sql_online.php
4. https://sqliteonline.com/

SEMESTER- II

Subject Code	Course Title		
21MC201	Data Structures		
21MC202	Object Oriented Programming through Java		
21MC203	Foundations of Data Science		
21MC204	Software Engineering		
21MC205	Managerial Economics and Financial Analysis		
-	Professional Elective – I	21MC211	1. Linux Programming
		21MC212	2.Object Oriented Analysis and Design
		21MC213	3. E-Commerce
21MC206	Data Structures Lab		
21MC207	Object Oriented Programming through Java Lab		
21MC208	Foundations of Data Science Lab		
21MC209	Career Competency Development Program - II		
21MC210	Value Added Course/ Certificate Course		

NARAYANA ENGINEERING COLLEGE::NELLORE								
21MC201	DATA STRUCTURES							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-requisite: Knowledge of Mathematics, Computer Programming, Analytical & Logical Skills

Course Objectives:

1. To explain efficient storage mechanisms of data for an easy access.
2. To design and implementation of various basic and advanced data structures.
3. To introduce various techniques for representation of the data in the real world.
4. To develop applications using data structures.
5. To pertain knowledge on improving the efficiency of algorithm by using suitable data structure.

Course Outcomes: After successfulcompletion of the course, student will be ableto:

CO 1	Understand basic concepts of data structures and algorithm analysis. **(BL - 2)**
CO 2	Develop the applications using stacks and queues. **(BL - 3)**
CO 3	Demonstrate use of different types of linked lists. **(BL - 2)**
CO 4	Apply the tree data structures for various applications. **(BL - 3)**
CO 5	Apply the graph data structures for various applications. **(BL - 3)**

CO-PO Mapping

CO	PO												PSO	
	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO 1	1	1	2										1	
CO 2	2	3	2	2									2	1
CO 3	2	2	3	2	2								3	2
CO 4	2	2	2	1	1							2	3	2
CO 5	2	2	3	1								1	3	1

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	Introduction to Data Structures	9H

Introduction: Overview of Data Structures, Implementation of Data Structures, Algorithm Specifications, Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off, Arrays.

Searching: Introduction, Basic Terminology, Linear Search and Binary Search Techniques and their complexities.

At the end of the Module 1, students will be able to:

1. Understand the linear and non-linear data structures. (BL - 2)

2. Understand the time and space complexities of an algorithm. (BL - 2) 3. Illustrate representation of data using Arrays. (BL - 2) 4. Explain searching techniques. (BL - 2)		
MODULE -2	**Stacks and Queues**	**9H**
Stacks: Introduction, Representation of a Stack, Stack Operations, Applications of Stacks. **Queues:** Introduction, Representation of a Queue, Queue Operations, Various Queue Structures: Circular Queue, Double Ended Queue, Priority Queue, Applications of Queues.		
At the end of the Module 2, students will be able to: 4. Explain stack ADT and its operations. (BL - 2) 5. Understand the expression evaluation using stacks. (BL - 2) 6. Implement various queue structures. (BL - 3)		
MODULE-3	**Linked Lists and Sorting**	**10H**
Introduction, Singly linked lists, Doubly Linked Lists, Circular Linked Lists, Linked Stacks and Queues, Applications of Linked Lists. **Sorting:** Introduction, Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort		
At the end of the Module 3, students will be able to: 1. Understand basics concepts of linked lists. **(BL - 2)** 2. Illustrate various structures of linked lists. **(BL - 2)** 3. Understand the concept of sorting. **(BL - 2)**		
MODULE-4	**Trees**	**10H**
Introduction, Basic Terminologies, Definition and concepts, Representation of Binary Tree, operations on a BinaryTree, Binary SearchTree, Height balancedBinaryTree, B Trees.		
At the end of the Module 4, students will be able to: 1. Understand the concept of trees. **(BL - 2)** 2. Compare different tree structures. **(BL - 2)** 3. Apply trees for indexing. **(BL - 3)**		
MODULE-5	**Graphs& Hashing**	**10H**
Graphs: Introduction, Graph Terminologies, Representation of Graphs, Graph Operations, Shortest Paths, Topological Sorting, Minimum Spanning Trees – Kruskal's and Prim's algorithms. **Hashing:** Introduction to Hash Table, Static Hashing, Dynamic Hashing.		
At the end of the Module 5, students will be able to: 1. Explain the importance of Graphs for solving problems. **(BL - 2)** 2. Understand graph traversal methods. **(BL - 2)** 3. Implement algorithms to identify shortest path. **(BL - 3)**		
	Total hours:	**48 hours**
Content beyond syllabus: • Activation Record Management • Optimum Sorting Algorithms		
Self-Study: Contents to promote self-Learning:		

SNO	Module	Reference
1	**Introduction to Data Structures**	https://www.youtube.com/watch?v=coxWfcz_sIk&list=PLrjkTql3jnm8ikiQIeIHrMYCaBfkBkfYR&index=1 https://www.youtube.com/watch?v=qt6gnsxevZ0&list=PLrjkTql3jnm8ikiQIeIHrMYCaBfkBkfYR&index=5 https://www.youtube.com/watch?v=NlWEdScxU9k&list=PLrjkTql3jnm8ikiQIeIHrMYCaBfkBkfYR&index=7
2	**Stacks and Queues**	https://www.youtube.com/watch?v=o-B4qNnwujY&list=PLrjkTql3jnm8ikiQIeIHrMYCaBfkBkfYR&index=10 https://www.youtube.com/watch?v=UK8WaQYdcMo&list=PLrjkTql3jnm8ikiQIeIHrMYCaBfkBkfYR&index=12
3	**Linked List and Sorting**	https://www.youtube.com/watch?v=hGxtTPPpqQs&list=PLrjkTql3jnm8ikiQIeIHrMYCaBfkBkfYR&index=22 https://www.youtube.com/watch?v=TnU8COKcZs&list=PLrjkTql3jnm8ikiQIeIHrMYCaBfkBkfYR&index=52
4	**Trees**	https://www.youtube.com/watch?v=e14hpagIr3U&list=PLrjkTql3jnm8ikiQIeIHrMYCaBfkBkfYR&index=26
5	**Graphs**	https://www.youtube.com/watch?v=ZAU5IlCQBls&list=PLrjkTql3jnm8ikiQIeIHrMYCaBfkBkfYR&index=46

Text Book(s):

3. D. Samanta, **Classic Data Structures**, 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
4. Ellis Horowitz and SartajSahni, **Fundamentals of Data Structures in C**, 2nd Edition, Universities Press, 2008.

Reference Book(s):

1. Data Structures A Pseudo code Approach with C, Second Edition by Richard F. Gilberg, Behrouz A. Forouzan, Cengage Learning.
2. Data Structures and Algorithms Using C++ by AnandaRaoAkepogu, RadhikaRajuPalagiri, Pearson, 2010.
3. Data Structures and Algorithms Made Easy by NarasimhaKarumanchi, Careermonk Publications, 2016
4. Peter Bras, “Advanced Data Structures”, Cambridge University Press, 2014
5. Data Structures, RS Salaria, Khanna Publishing House, 3rd Edition, 2017
6. Data Structures through C, YashwantKanetkar, BPB Publications, 3rd Edition, 2019
7. Expert Data Structures with C, RB Patel, Khanna Publications, 2019

Online Resources / Web Resources:

1. https://nptel.ac.in/courses/106/102/106102064/
2. https://swayam.gov.in/nd2_cec19_cs04/preview
3. https://www.youtube.com/watch?v=0IAPZzGSbME&list=PLDN4rrl48XKpZkf03iYF

l-O29szjTrs_O
4. https://www.youtube.com/playlist?list=PLrqxgoIHbaCQPHa2LnGX0f-dCIH2MWlFS
5. https://www.youtube.com/playlist?list=PLrjkTql3jnm8ikiQIeIHrMYCaBfkBkfYR
6. https://www.tutorialspoint.com/data_structures_algorithms/data_structures_basics.htm
7. https://www.hackerrank.com/domains/data-structures
8. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
9. https://discuss.codechef.com/t/data-structures-and-algorithms/6599
10. https://books.goalkicker.com/AlgorithmsBook/

NARAYANA ENGINEERING COLLEGE:: NELLORE								
21MC202	OBJECT ORIENTED PROGRAMMING THROUGH JAVA							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-requisite: Basic knowledge of programming.

Course Objectives:

1. To acquire knowledge on preliminaries of Java.
2. To provide sufficient knowledge on developing real world problems.
3. To demonstrate the principles of packages, inheritance and interfaces.
4. To understand exception handling and Multi threading.
5. To understand the concepts of Applets and I/O Files.

Course Outcomes: After successful completion of the course, Student will be able to:

CO1	Implement basic Programming concepts. (BL-3)
CO2	Understand the concepts of Arrays and Strings. (BL-2)
CO3	Construct programs on classes, inheritance, polymorphism and interfaces. (BL-3)
CO4	Develop packages, handling of Exceptions and Applets. (BL-3)
CO5	Construct programs using multi-threading. (BL-3)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2									1	3	2
CO2	2	2	2		1							1	1	2
CO3	2	2	2	2	1				1			2	1	2
CO4	2	2	2	1								3	1	1
CO5	2	2		2					1			3	2	1

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	Basic concepts of java	9H

The History and Evolution of java: History of java, The java Buzz words, The Evolution of java, Lexical issues.Data types, variables: Data types, Variables, The Scope and Life time of variables, Operators, Expressions, Control statements, Type conversion and casting, Command Line Arguments.

At the end of the Module 1, students will be able to:

1. Explain the importance of java. (BL-2)
2. Identify various basic components of java. (BL-2)
3. Implement programs on fundamental concepts of java. (BL-3)

MODULE -2	Arrays and Strings	9H

Declaration, Initialization and accessing values, One-Dimensional Arrays, Multi-dimensional arrays, Alternative Array Declaration Syntax, var-arg methods, Wrapper Classes.String, StringBuffer and StringBuilder classes.

At the end of the Module 2, students will be able to: 1. Understand Arrays and accessing array values.(BL-2) 2. Demonstrate 1-D and Multi-dimensional arrays.(BL-2) 3. Explain the String, StringBuffer, StringBuilder Classes.(BL-2)		
MODULE-3	**OOPs Concepts**	**10H**
Basic Characteristics of OOP, Class fundamentals. Declaration objects, Introducing Methods, Constructors, this keyword.Inheritance, Types of inheritance, Member access rules, Abstract Classes, Super and final keywords**.** Method overloading and overriding.Defining an interface, Implementing interface, Accessing interface properties.		
At the end of the Module 3, students will be able to: 1. Understand the basic syntax for class fundamentals.(BL-2) 2. Explain Access modifiers in Inheritance.(BL-2) 3. Compare and Contrast Method overloading and Method overriding.(BL-3) 4. Explain interface and its implementation.(BL-2)		
MODULE-4	**Packages , Exception Handling and Applets**	**10H**
Packages: Defining Package, Built in packages,accessing Packages, Creating packages, accessing Protection. Exception Handling: Exception handling Fundamentals, exception types, Built-in Exceptions, Using try-catch-finally throw- throws keywords, creating your own Exceptions.		
At the end of the Module 4, students will be able to: 7. Develop user defined packages.(BL-3) 8. Implement Exception Handling.(BL-3) 9. Write our own Exceptions (BL-1) 10. Implement Applet Life Cycle Methods. (BL-3)		
MODULE-5	**Multi-Threaded Programming and Files**	**10H**
Multi-Threaded Programming: The java thread model, Thread Life Cycle, The main() thread, creating a Thread, Creating Multiple Threads, Using isalive() and join(), Thread Priorities, Synchronization.I/O Files: Byte Oriented and Character oriented classes, RandomAccess Files.Applets: Introduction to Applets, Applet Life Cycle methods.		
At the end of the Module 5, students will be able to: 1. Explain the concept of multi threaded concept.(BL-2) 2. Discuss thread states and its priorities.(BL-3) 3. Understand the concept of Synchronization.(BL-2) 4. Demonstrate input/output Files.(BL-3)		
	Total hours:	**48 Hours**

Content beyond syllabus:

1. Event Handling Mechanism
2. GUI Programming in JAVA

Self-Study: Contents to promote self-Learning:

SNo	Module	CO	Reference

1	Basic concepts of java	CO1	https://nptel.ac.in/courses/106/105/106105191/ (lecture 1, 2, 3)
2	Arrays and String Handling	CO2	https://www.youtube.com/watch?v=TmM9XAIKa-Y https://www.youtube.com/watch?v=bjbtBtYwIGg
3	OOPs Concepts	CO3	https://nptel.ac.in/courses/106/105/106105191/ (lecture 13,14,15) https://youtu.be/2duE6dWb6dY
4	Packages, Exception Handling and Applets	CO4	https://nptel.ac.in/courses/106/105/106105191/ (lecture 20,21,22,23) https://youtu.be/0pzR2FGTEhk
5	Multi-Threaded Programming and Files	CO5	.https://www.youtube.com/watch?v=TCd8QIS-2KI https://www.edureka.co/advanced-java-sp?qId=856296e26b4a2a954919bfb8fb145248&index_name=prod_search_results_courses&objId=193&objPos=1 https://youtu.be/fnFQWtZZE-4

Text Book(s):

1. "Java The complete reference", Herbert Scheldt, 9th edition, McGraw Hill Education (India) Pvt. Ltd.
2. Beginning Java 2, Ivor Horton, JDK 5th Edition, WileyDreamtech.

Reference Book(s):

1. R A. Johson-Thomson,An introduction to java programming and object oriented application development,
2. Y Daniel liang, Introduction to java programming 6th Edition, Pearson Education.
3. C.Xavier, Java programming: A practical approach, First edition,TMH, 2011.
4. Bruce Eckel, Thinking in Java, 2nd Edition, Pearson Education
5. H.M Dietel and P.J Dietel, Java How to Program, 6th Edition, Pearson Ed.
6. Y. Daniel Liang, Introduction to Java programming-comprehensive, 10E, Pearson ltd 2015.
7. E Balagurusamy, Programming With Java: A Primer 5th Edition Tata McGraw Hill.

Online Resources/ Web References:

1. https://www.edx.org/professional-certificate/uc3mx-introduction-java-programming
2. https://www.coursera.org/specializations/java-programming
3. https://www.classcentral.com/course/java-programming-4305
4. https://www.edx.org/course/learn-to-program-in-java-2
5. https://nptel.ac.in/courses
6. https://freevideolectures.com/university/iitm
7. https://www.javatpoint.com/java-tutorial
8. https://www.w3resource.com/java-exercises/
9. https://www.geeksforgeeks.org/java/

NARAYANAENGINEERINGCOLLEGE:NELLORE								
21MC203	FOUNDATIONS OF DATA SCIENCE							R 21
Semester	Hours/ Week			Total Hrs	Credit	MaxMarks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-requisite: Python programming, Data Mining, ML Algorithms, Probability and Statistics Concepts

CourseObjectives:

1. To introduce the field of data science, the nature and structure of data.
2. To emphasize the importance and application of statistics in analyzing the data.
3. To develop the skills in using data science techniques for solving data intensive problems.
4. To understand learning concepts that is vital for data science.
5. Toexplain the concepts of supervised and unsupervised learning.
6. Toevaluatedatavisualizationsbasedonpython programming.

CourseOutcomes:Aftersuccessfulcompletionofthecourse,thestudentwillbeableto:

CO1	Memorize the statistics concepts applicable to data science **(BL-1)**
CO2	Demonstrate data analysis, manipulation and visualization of data using Python libraries such as Pandas, Matplotlib and Plotly etc. **(BL-2)**
CO3	Enumerate machine learning algorithms. **(BL-1)**
CO4	Analyze the various applications of data science**. (BL-4)**
CO5	To demonstratetheclustering algorithms .**(BL-3)**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	1	3	3										1	1
CO2	2		2										1	2
CO3		3	2										2	1
CO4	2		2										1	2
CO5	1	2	2										1	2

COURSECONTENT

MODULE – 1	Introduction to Probability and Statistics	12H

Descriptive Statistics: Measures of central tendency – mean, median, mode, hormonic mean and geometric mean.
Measures of dispersion: mean deviation from mean, standard deviation and variance.
Central moments: Covariance and correlation, rank correlation.
Sampling distributions: Hypothesis testing, definition of random variable and probability.
Probability distributions: Bernoulli, Binomial, Poisson.
Continuous probability distributions: Gaussian, exponential, Chi-square. Definition of Bayes probability. What Is data science, How does data science relate to other fields, Eigen values &Eigen vectors, Sparse matrices.

Learning Outcomes:
At the end of theModule1, students will be able to:

1. Describe the data science affects various fields. **(BL-1)**
2. Memorize the statistics concepts applicable to data science.**(BL-1)**
3. Solve the measures of dispersion. **(BL-3)**

MODULE - 2	Python for Data Science	12H

Python for Data Analysis: Introduction to Numpy, Numpy Arrays and indexing, Introduction to pandas, Series, Data frames, Missing data, Groupby, Merging Joining and Concatenating, read csv and json, Cleaning Data.
Python for Data Visualization: Matplot lib library**,** Seaborn Distribution, Matrix and Regression Plots, Introduction to SKlearn and Plotly.

Learning outcomes:
At the end of the Module 2, students will be able to:

1. Execute programs using python libraries such as Numpy, Pandas**. (BL-3)**
2. Execute and solve data visualization problems with python libraries like matplotlib, Seaborn and Plotly**. (BL-3)**

MODULE-3	Regression	8H

Data Preprocessing in Python, Regression, Simple Linear regression, Multiple Linear Regression, Polynomial regression, Support Vector Regression(SVR), Decision Tree Regression.

At the end of the Module 3, students will be able to:

1. Apply data preprocessing steps using python. **(BL-3)**
2. Describe the regression techniques and implements the models. **(BL-3)**

MODULE-4	Supervised Learning -Classification	8 H

Introduction to Supervised Learning: Logistic Regression, K-Nearest Neighbors(KNN), Support vector Machine(SVM), Naïve Bayes, Decision Tree Classification, Random Forest Classification.

At the end of the Module 4, students will be able to:

1. Understand the classification of learning strategies. **(BL-3)**
2. Evaluate various classification techniques. **(BL-3)**

MODULE-5	Unsupervised Learning -Clustering	8H

Introduction to Unsupervised Learning: K-Means Clustering, Hierarchical Clustering, Introduction to Reinforcement Learning, Principal Component Analysis(PCA), Linear Discriminant Analysis(LDA).

At the end of the Module 5, students will be able to:

1. Understand the differentiation between classification and clustering. **(BL-2)**
2. Compare and contrast various clustering techniques. **(BL-2)**
3. Understand new learning strategy used in real time scenario. **(BL-2)**

TotalHours:	48Hours

Self-Study:
Contents to promote self-Learning:

SNo	Module	CO	Reference
1	Introduction to Probability and Statistics	CO1	https://www.dataquest.io/blog/best-free-tools-data-science/
2	Python for Data Science	CO2	https://nptel.ac.in/courses/106/106/106106179/(Week-2Lec:12To18)
3	Regression	CO3	https://www.youtube.com/playlist?list=PLyqSpQzTE6M_fFg1zZmeGIkenMDgXKGYi
4	Supervised Learning - Classification	CO4	https://www.youtube.com/watch?v=fn1rKKNLuzk&list=PL15FRvx6P0OWTlNBS_93NHG2hIn9cynVT https://www.youtube.com/watch?v=2pWv7GOvuf0&list=PLqYmG7hTraZDM-OYHWgPebj2MfCFzFObQ
5	Unsupervised Learning - Clustering	CO5	https://www.youtube.com/watch?v=NOIfMY0KajE https://youtu.be/GGL6U0k8WYA

TextBook(s):

1. A HandsOnIntroductiontoDataScience,CambridgeUniversityPress,ISBN10:1108472443,2020.
2. PrinciplesofDataScience-Learnthetechniquesandmathyouneedtostartmakingsenseofyourdataby SinanOzdemir,

ReferenceBook(s):

1. JoelGrus,DataSciencefromScratch,Oreillymedia,2015.
2. Gareth James Daniela Witten Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning with Applications in R, February11, 2013.
3. MarkGardener,BeginningRThe statisticalProgrammingLanguage, Wiley,2015.
4. Han ,Kamber, and J Pei, Data Mining Concepts and Techniques,3rd edition, Morgan Kaufman,2012.
5. LinearAlgebraandItsApplications, 4thEdition,GilbertStrang
6. 4.Python Data Science Handbook by Jake VanderPlasReleased November 2016 Publisher(s): O'ReillyMedia, Inc.ISBN: 9781491912058

OnlineResources/WebReferences:

1. https://intellipaat.com/blog/tutorial/data-science-tutorial/
2. https://www.guru99.com/data-science-tutorial.html
3. https://www.edureka.co/blog/data-science-tutorial/
4. https://www.programmer-books.com/introducing-data-science-pdf/
5. https://onlinelibrary.wiley.com/doi/book/10.1002/9781119092919
6. https://www.digiteum.com/data-visualization-techniques-tools
7. https://towardsdatascience.com/applications-of-reinforcement-learning-in-real-world-1a94955bcd12
8. https://scikit-learn.org/stable/modules/tree.html
9. https://www.academia.edu/8135057/Methods_of_Data_Analysis

NARAYANA ENGINEERING COLLEGE:NELLORE							
21MC204	SOFTWARE ENGINEERING						R 21
Semester	Hours / Week			Total hrs	Credit	Max Marks	
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-requisite: Programming Skills

Course Objectives:

1. To understand the software life cycle models.
2. To understand the software requirements and SRS document.
3. To understand the important of modeling and modeling languages
4. To design and develop correct and robust software products
5. To understand the maintenance of the software.

Course Outcomes: After successful completion of the course, Student will be able to:

CO 1	Identify the best suitable Process Methodology for developing a quality-oriented software solution **(BL-3)**
CO 2	Sketch the requirements analysis model for a project work by using various modelling diagrams. **(BL-3)**
CO 3	Apply the standard design principles based on the suitable architectural styles for given specifications. **(BL-3)**
CO 4	Describe the standard Golden rules for developing the user interface. **(BL-2)**
CO 5	Apply testing principles on software project and identify various software metrics **(BL-3)**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	3	3										1	1
CO2	2		2										1	2
CO3		3	2										2	1
CO4	2		2										1	2
CO5	1	2	2										1	2

COURSE CONTENT		
MODULE – 1	**The Software Process**	**10H**

The Nature of Software, The Unique Nature of Web Apps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths**.** A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology, Product and Process. Agility and the Cost of Change, Agile Process, Extreme Programming.

At the end of the Module 1, students will be able to: 1.Demonstrate the different phases involved in the software development. (BL-3) 2.Classify the various process models. (BL-2) 3. Identify suitable lifecycle model to be used. (BL-3) 4. Identify the need of agility and examine Agile process models (BL-3)		
MODULE -2	**Modeling Concepts**	**10H**
Requirements Engineering, Eliciting Requirements, Developing Use Cases, and Building the requirements model, Negotiating Requirements, Validating Requirements. Requirements Analysis, Scenario-Based Modeling, UML Models that Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling**.**		
At the end of the Module 2, students will be able to: 4. Understand the requirements. (BL-2) 5. Solve the problem by defining the computing requirements of the problem. (BL-3) 6. Organize the scenario-based modeling and class based modeling in the design phase (BL-3) 7. Construct SRS for Problems. (BL-3)		
MODULE-3	**Design concepts**	**10H**
Design with Context of Software Engineering, The Design Process, Design Concepts, The Design Model. Software Architecture, Architecture Genres, Architecture Styles, Architectural Design, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow. Component, Designing Class-Based Components, Conducting Component-level Design, Designing Traditional Components, Component-Based Development**.**		
At the end of the Module 3, students will be able to: 1. Identify the basic issues in software design. (BL-3) 2. Illustrate the importance of software architecture. (BL-2) 3. Apply the standard design principles based on suitable Architecture. (BL-3)		
MODULE-4	**User Interface Design, Coding and Testing**	**9H**
Characteristics of a Good User Interface, Basic Concepts, Types of User Interfaces, Fundamentals of Component-based GUI Development, A User Interface Design Methodology. Coding, Code Review, Software Documentation, Testing, Unit Testing, Black-box Testing, White-Box Testing		
At the end of the Module 4, students will be able to: 1. Analyze the architecture styles and build the system from the components. (BL-3) 2. Describe the golden rules in designing and analyzing UI. (BL-2) 3. Explain the user interface design process. (BL-2) 4. Explain the MVC (model-view-controller) design pattern and its importance to sound user interface software design and implementation. (BL-2)		
MODULE-5	**Software Quality & Product Metrics**	**9H**
Software Quality, Software Quality Management System, ISO 9000, SEI Capability Maturity **Model Product metrics:** Metrics for Requirements Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.		

At the end of the Module 5, students will be able to: 1. Illustrate the strategic approach to software testing (BL-2) 2. Describe the art of debugging (BL-2) 3. Explain the various testing strategies (BL-2) 4. Describe the Product metrics in Software Quality(BL-2)	
Total hours:	**48 hours**

Content beyond syllabus:

Open source software Testing Automation Tools

Self-Study:

Contents to promote self-Learning:

SNO	MODULE	CO	Reference
1	Software engineering Basics	**CO1**	https://nptel.ac.in/courses/106/105/106105182/ (Module 1 – Lecture 1-5) http://digimat.in/nptel/courses/video/106105182/L01.html (lecture 1 to 5)
2	Requirements Engineering	**CO2**	https://nptel.ac.in/courses/106/105/106105182/ (Module 4– Lecture 16 & 17) http://digimat.in/nptel/courses/video/106105182/L16.html (lecture 16)
3	Software design Basics Architectural Design	**CO3**	https://nptel.ac.in/courses/106/105/106105182/ (Module 4– Lecture 19 & 20) https://www.youtube.com/watch?v=IPlP2R7l-Nc
4	User Interface	**CO4**	https://nptel.ac.in/courses/106/105/106105087/
5	Software Testing & Product metrics	**CO5**	https://nptel.ac.in/courses/106/105/106105182/ (Module 9 to 12– Lecture 43 & 60) http://digimat.in/nptel/courses/video/106105182/L16.html (lecture 21)

Text Book(s):

1. Software engineering A practitioner's Approach, Roger S. Pressman, Seventh Edition, McGraw Hill International Education, 2016.
2. Fundamentals of Software Engineering, Rajib Mall, , Third Edition, PHI.

Reference Book(s):

1. Ian Somerville, Software Engineering, 9th Edition Pearson Education Asia,2011.
2. Pankaj Jalote, A concise introduction to software Engineering, Springer

3. PankajJalote, Software Engineering, A Precise Approach, Wiley India,2010
4. Jim Arlow, Ila Neustadt, UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design, 2nd Edition, Pearson, (2005).
5. K.K. Agarwal & Yogesh Singh, Software Engineering, New Age International Publishers, 2007

Online references/ Web references:

1.https://nptel.ac.in/courses/106/105/106105182/
2.http://digimat.in/nptel/courses/video/106105182/L01.html (lecture 1-39)
3.https://www.tutorialspoint.com/software_engineering/software_engineering_overview.htm
4.http://www.tutorialspoint.com/software_engineering
5.https://www.w3schools.in/sdlc-tutorial/software-development-life-cycle-sdlc/
6.https://www.tutorialspoint.com/software_engineering/index.htm
7.https://www.tutorialspoint.com/software_quality_management/software_quality_measurement_metrics.htm

21MC205	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-requisite:

Course Objectives:

1. To understand the concepts of managerial economics and financial analysis this helps in optimal decision making in business environment.
2. To have a thorough knowledge on the production theories and cost while dealing with the production and factors of production.
3. To have a thorough knowledge regarding market structure and forms of business organizations in the market.
4. To understand the concept of capital and capital budgeting in selecting the proposals.
5. To have a thorough knowledge on recording, classifying and summarizing of transactions in preparing of final accounts.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	Outline the Managerial Economic concepts for decision making and forward planning. Also know law of demand and its exceptions, to use different forecasting methods for predicting demand for various products and services. (L2)
CO 2	Assess the functional relationship between Production and factors of production and list out various costs associated with production and able to compute breakeven point to illustrate the various uses of breakeven analysis. (L5)
CO 3	Outline the different types of business organizations and provide a framework for analyzing money in its functions as a medium of exchange. (L2)
CO 4	Interpret various techniques for assessing the proposals of project for financial position of the business. (L2)
CO 5	Identify the principles of accounting to record, classify and summarize various transactions in books of accounts for preparation of final accounts. (L3)

CO-PO Mapping

CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	P09	P010	P011	P012
CO1							2	1				1
CO2							2			1		
CO3							2	1				
CO4		2	2								1	
CO5		2									1	

1: Low, 2-Medium, 3- High

COURSE CONTENT		
MODULE – 1	**INTRODUCTION TO MANAGERIAL ECONOMICS DEMAND**	**10 H**

Managerial Economics – Definition – Nature & Scope - Contemporary importance of Managerial Economics - Demand Analysis - Concept of Demand - Demand Function - Law of Demand - Elasticity of Demand - Significance - Types of Elasticity - Measurement of Elasticity of Demand - Demand Forecasting - Factors governing Demand Forecasting - Methods of Demand Forecasting - Relationship of Managerial Economics with Financial Accounting and Management.

At the end of the Module 1, students will be able to:

1. Understand the concept of managerial economics and its importance. (L2)
2. Analyze how managerial economics is helpful in decision making. (L4)
3. Assess the importance of demand & Supply. (L5)
4. Assess the impact of law of demand towards the organization. (L5)
5. Apply various methods of demand forecasting to predict demand for products.(L3)
6. Apply how managerial economics is useful in other areasfor decision making.(L3)

MODULE -2	THEORY OF PRODUCTION AND COST ANALYSIS	10 H

Production Function – Least-cost combination - Short-run and Long-run Production Function - Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale – Cost &Break Even Analysis - Cost concepts and Cost behavior - Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems) - Managerial significance and limitations of Break-Even Analysis.

At the end of the Module 2, students will be able to:

1. Understand the concept of production function.(L2)
2. Apply the concept of various production function in identifying the cost.(L3)
3. Identify the importance of isoquants and isocosts in production function.(L3)
4. Identify the importance of cost analysis in production function.(L3)
5. Understand the concept of break even analysis in identifying the sales.(L2)

MODULE-3	INTRODUCTION TO FORMS OF BUSINESS ORGANIZATIONS AND MARKETS	9 H

Market structures - Forms of Business Organizations - Sole Proprietorship - Partnership - Joint Stock Companies - Public Sector Enterprises-Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition – Monopoly - Monopolistic Competition – Oligopoly - Price-Output Determination - Pricing Methods and Strategies.

At the end of the Module 3, students will be able to:

1. Understand the concept of market structures.(L2)
2. Define the importance sole proprietorship.(L1)
3. Name the various forms of organizations.(L1)
4. Develop the importance of price determination in monopoly market.(L3)
5. Develop various pricing methods in fixation of prices towards the products.(L3)

MODULE-4	CAPITAL AND CAPITAL BUDGETING	9 H

Concept of Capital - Significance - Types of Capital - Components of Working Capital Sources of Short-term and Long-term Capital - Estimating Working capital requirements – Cash Budget - Capital Budgeting – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

At the end of the Module 4, students will be able to:

1. Define the concept of capital and capital budgeting. (L1)
2. Understand the concept of capital budgeting.(L2)
3. Identify the requirement of working capital in business. (L3)
4. Understand the importance of capital budgeting methods in evaluating

theproposals.(L3) 5. Distinguish between traditional and modern methods of capital budgeting.(L4)		
MODULE-5	**INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS**	**9 H**
Accounting Concepts and Conventions - Introduction Double-Entry Book Keeping, Journal, Ledger, and Trial Balance - Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.		
At the end of the Module 5, students will be able to: 1. Understand the importance of accounting principles in preparing the book ofaccounts.(L2) 2. Understand the importance of financial accounting in business enterprise.(L2) 3. Identify the procedure of preparing journal, ledger and train balance.(L3) 4. Define the process of preparing final accounts.(L1) 5. Asses the financial position of business enterprise.(L5)		
Total hours: 48hours		

Text Book(s):

1. Managerial Economics, Varshney &Maheswari, Sultan Chand, 2013.
2. Business Economics and Financial Analysis, Aryasri, 4th edition, MGH, 2019

Reference Books:

1. Ahuja Hl "Managerial economics" 3 rd edition, Schand, ,2013
2. S.A. Siddiqui and A.S. Siddiqui: "Managerial Economics and Financial Analysis", New Age International,. 2013.
3. Joseph G. Nellis and David Parker: "Principles of Business Economics", 2nd edition, Pearson, New Delhi.
4. Domnick Salvatore: "Managerial Economics in a Global Economy", Cengage, 2013.

Web resources/Online resources:

1. https://youtu.be/vLPpF0hunwc
2. https://youtu.be/Z2Tny1kFZsg
3. https://youtu.be/UxfPGWlxgHQ?list=PLzh5MokdJ8AzxRY9AN8ovKez6pHTJnJKU
4. https://youtu.be/y132ILD4Vvg
5. https://youtu.be/g6UCv4rkZ_Y

NARAYANA ENGINEERING COLLEGE::NELLORE								
21MC206	Data Structures Lab							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	0	0	3	48	1.5	40	60	100

Pre-requisite: Knowledge of Mathematics, Computer Programming, Analytical & Logical Skills

Course Objectives:

1. To introduce various data structures.
2. To elucidate how the data structure selection influences the algorithm complexity.
3. To explain the different operations that can be performed on data structures.
4. To introduce to the search and sorting algorithms.

Course Outcomes: After successful completion of the course, Student will be able to:

CO 1	Apply linear data structures to different applications. (BL -3)
CO 2	Develop programs on linked list. (BL -3)
CO 3	Implement operations on binary trees and binary search trees. (BL -3)
CO 4	Implement searching and sorting algorithms. (BL -3)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2										1	
CO2	2	2	2										2	1
CO3	2	2	3	1	2								3	2
CO4	2	2	2	1	1								3	2

1: Low, 2-Medium, 3- High

COURSE CONTENT	CO
TASK-1	**(3H)**
1. Write a Program to Implement the following Searching Algorithms: a) Linear Search b) Binary Search	CO1
TASK-2	**(6H)**
1. Implement the following using arrays: A. Write a Program to Implement Stack Operations B. Write a Program to convert a given infix expression into its Postfix using stack. C. Write a Program to evaluate the Postfix Expression using stack	CO1
TASK-3	**(3H)**
1. Write a Program to Implement Queue Operations using Arrays 2. Write a Program to Implement Circular Queue Operations using Arrays	CO2
TASK-4	**(6H)**
1. Write a Program to implement the operations of Singly Linked List 2. Write a Program to implement the operations of Doubly Linked List	CO2
TASK-5	**(6H)**
1. Write a Program to implement stack operations using linked list 2. Write a Program to implement the operations of Circular Singly Linked List	CO3

TASK-6	(3H)
1.Write a Program to Sort the set of elements: a) Insertion Sortb) Quick Sort	C04
TASK-7	**(3H)**
1. Write a Program to Sort the set of elements: a) Merge Sort b) Heap Sort	C04
TASK-8	**(6H)**
1. Write a Program to implement the following on trees a) Insertion and deletion operations b) Traversals 2. Write a Program to implement Binary Search Tree Operations.	CO3
TASK-9	**(6H)**
1. Write a Program to implement the following Graph Traversal Algorithms: a) Depth first traversal b) Breadth first traversal	CO4
TASK-10	**(6H)**
1. Write a Program to implement the following Minimum Spanning Tree Algorithms: a) Kruskal's Algorithm b) Prim's Algorithm	CO4

Additional Experiments:	
TASK-1	
1. Write Program to Implement Fibonacci Search 2. Write a Program to Implement Double Ended Queue Operations by using Array	CO4
TASK-2	
1. Write a Program to Implement Tree traversal Techniques 2. Write a Program to Implement Radix Sort	CO4

Virtual Labs:

1. Data Structures – 1 (IIIT HYDERABAD) : https://ds1-iiith.vlabs.ac.in/data-structures-1/

List of Experiments

Sorting
1. Bubble Sort
2. Merge Sort
3. Heap Sort
4. Quick Sort

Graphs
1. Depth First Search
2. Breadth First Search

Trees
1. Tree Traversal
2. Binary Search Trees

Stacks and Queues
1. Stacks and Queues
2. Infix to Postfix

Searching
1. Unsorted Arrays
2. Hashtables

Linked Lists
1. Linked lists
2. Polynomial Arithmetic using linked lists

2. Data Structures – 2 (IIIT HYDERABAD) : https://ds2-iiith.vlabs.ac.in/data-structures-2/

List of Experiments

Sorting	Search Trees

1. Selection Sort 2. Radix Sort **Graphs** 1. Topological Sort 2. Minimum Spanning Trees 3. Path algorithms: Dijkstra's shortest path	1. 2-3 Tree 2. Red Black Tree **Strings** 1. Tries and Suffix Trees 2. Substring search: KMP algorithm

Text Book(s):

1. D. Samanta, "Classic Data Structures", 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Horowitz Sahni and Anderson-Freed —Fundamentals of Data Structures in C. 2nd Edition, Universities Press, 2008.

Reference Book(s):

1. Richard F. Gilberg& B. A. Forouzan —Data Structures A Pseudocode Approcah with C, Second Edition, CENGAGE Learning.
2. Ananda Rao,Data Structures and Algorithms Using C++,Akepogu, Radhika Raju Palagiri, Pearson, 2010.
3. Mark Allen Weiss, Data structure and Algorithm Analysis in C. Addison Wesley Publication. 2006.
4. Jean Paul Trembley and Paul G. Sorenson, An Introduction to Data Structures with Applications, 2ndEdition, McGraw Hill Education, 2017
5. Thomas Cormen, C. Leiserson, R. L. Rivest and C. Stein, —Introduction to Algorithms, 2nd Edition, PHI, 2010
6. Narasimha Karumanchi, Data Structures and Algorithms Made Easy, Careermonk Publications, 2016
7. Peter Bras, Advanced Data Structures, Cambridge University Press, 2014
8. Data Structures, RS Salaria, Khanna Publishing House, 3rd Edition, 2017
9. Data Structures through C, Yashwant Kanetkar, BPB Publications, 3rd Edition, 2019
10. Expert Data Structures with C, RB Patel, Khanna Publications, 2019

Web Resources:

1. http://cse01-iiith.vlabs.ac.in/
2. https://www.javatpoint.com/data-structure-tutorial
3. https://www.faceprep.in/data-structures/data-structures-programs/
4. https://www.edureka.co/blog/c-data-structures/

NARAYANA ENGINEERING COLLEGE:NELLORE								
21MC207	OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	0	0	2	36	1	40	60	100

Pre-requisite: Basics in C

Course Objectives:

1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
2. Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
3. Be aware of the important topics and principles of software development.
4. Have the ability to write a computer program to solve specified problems.
5. Be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	Construct programs using Class, object and Constructor relationship in Object Oriented Programming.
CO 2	Implement basic knowledge of Operations, Expressions, Control-flow, Strings with the help of Java in Object Oriented Programming.
CO 3	Analyze the significance of various keywords and implement reusability of code, Encapsulation and polymorphism technique in OOPs.
CO 4	Implements Interface ,exception handling in Java
CO 5	Implement Multithreading, packages and Applet (Web program in java) programming concept in Java.

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		3	3										1	3
CO2		3	2		2								3	2
CO3		3	2		3							2	2	2
CO4		3	2						2	2	2	3	2	2
CO5		3	3	2	3				2	2	2	3	3	3

1: Low, 2-Medium, 3- High

COURSE CONTENT	CO
Task 1 - Basics	
a a). Write a JAVA program to display default value of all primitive data type of JAVA. b). Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root. c) Write a case study on public static void main(250 words).	CO 1
Task -2 Operations, Expressions, Control-flow, Strings	

a). Write a JAVA program to search for an element in a given list of elements using binary search mechanism. ? b). Write a JAVA program to sort for an element in a given list of elements using bubble sort? (c) Write a program to perform the following operations on strings through interactive input. 1) Sort given strings in alphabetical 2) Convert the strings to uppercase. ?	CO 1
Task -3 Class, Objects	
a). Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method. ? b). Write a JAVA program to implement constructor. ?	CO 2
TASK-4 Methods	
a). Write a JAVA program to implement constructor overloading. ? b). Write a JAVA program implement method overloading. ?	CO 2
TASK-5 Inheritance	
a). Write a JAVA program to implement Single Inheritance? b). Write a JAVA program to implement multi level Inheritance? c). Write a java program for abstract class to find areas of different shapes?	CO 3
TASK-6 Interfaces	
a). Write a JAVA program give example for “super” keyword. ? b). Write a JAVA program to implement Interface. What kind of Inheritance can be achieved? c). Write a JAVA program to implement multiple inheritance access in java?	CO 4
TASK-7 Exceptions	
a).Write a JAVA program that describes exception handling mechanism. ? b).Write a JAVA program Illustrating Multiple catch clauses?	CO 4
TASK-8 Runtime Polymorphism	
a). Write a JAVA program that implements Runtime polymorphism. b). Write a JAVA program to implement run time polymorphism using inheritance.	CO 4
TASK-9 User defined Exception	
a). Write a JAVA program for creation of Illustrating throw? b). Write a JAVA program for creation of Illustrating finally? c).Write a JAVA program for creation of User Defined Exception?	CO 4
TASK -10 Threads	
a). Write a program illustrating **isAlive** and **join ()**? b). Create two threads such that one of the thread print even no’s and another prints odd no’s up to a given range. ?	CO 5
TASK-11Packages	
a). Write a JAVA program that import and use the defined your package in the previous Problem? b). Write a Java Program to Create a package called “Arithmetic” that contains methods to deal with all arithmetic operations. Also, write a program to use the package.?	CO 5
Total Hours:	**48 H**

Additional Experiments:	
TASK-12Applet	
a).Write a JAVA program to paint like paint brush in applet. b) Write an applet illustrating sequence of events in an applet.	
TASK -13Event Handling	
a).Write a JAVA program that display the x and y position of the cursor movement using Mouse. ? b).Write a JAVA program that identifies key-up key-down event user entering text in a Applet. ?	

Virtual Labs:

1. https://cse11-iiith.vlabs.ac.in/MIPS1/Procedure.html?domain=Computer%20Science&lab=CSO%20Lab
2. https://www.researchgate.net/publication/225171615_Virtual_Programming_Lab_for_Online_Distance_Learning

Self-Study:

Contents to promote self-Learning:

SNO	Topic	Reference
1	Class-object Constructor relationship in Object Oriented Programming.	https://nptel.ac.in/courses/106/105/106105191/ Lecture (1,2,3)
2	Operations, Expressions, Control-flow, Strings with the help of Java	https://nptel.ac.in/courses/106/105/106105191/ Lecture (4,6)
3	Implement reusability of code, Encapsulation and polymorphism technique in OOPs	https://nptel.ac.in/courses/106/105/106105191/ Lecture (7,13)
4	Implements Interface ,exception handling in Java	https://nptel.ac.in/courses/106/105/106105191/ Lecture (20,21,22)
5	Multithreading, packages and Applet	https://nptel.ac.in/courses/106/105/106105191/ Lecture (17,18,19)

Text Book(s):

1. Java: Herbert Schildt "Java The complete reference", 9th edition, McGraw Hill Education (India) Pvt. Ltd.

2. Beginning Java 2, JDK 5 Edition, Ivor Horton,Wiley dreamtech.
3. Y. Daniel Liang, Introduction to Java programming-comprehensive version-Tenth Edition,
Pearson ltd 2015.

Reference Book(s):

1. An introduction to java programming and object oriented application development, R A Johson-Thomson.
2. Introduction to java programming 6th Edition, Y Daniel liang, Pearson Education.
3. Java programming: A practical approach, C.Xavier, TMH, First edition,2011.
4. Bruce Eckel [2008], [2nd Edition], Thinking in Java, Pearson Education.
5. H.M Dietel and P.J Dietel [2008], [6th Edition], Java How to Program, Pearson Ed.

Web Resources:

1. https://nptel.ac.in/courses
2. https://freevideolectures.com/university/iitm
3. www.javatpoint.com
4. https://www.tutorialspoint.com/jaindex.htm
5. https://docs.oracle.com/javase/tutorial/
6. https://nptel.ac.in/courses/106/105/106105191/
7. https://www.edx.org/professional-certificate/uc3mx-introduction-java-programming

NARAYANAENGINEERINGCOLLEGE:NELLORE								
21MC208	FOUNDATIONS OF DATA SCIENCE LAB							R21
Semester	Hours/ Week			Totalhrs	Credit	MaxMarks		
	L	T	P		C	CIE	SEE	TOTAL
II	0	0	3	48	1.5	40	60	100
Pre-requisite:Nil								
CourseObjectives: 1. To learn andwritepythonprograms for Numpy and Pandas. 2. To understandtheconcepts of data visualization. 3. Apply regression models on different datasets. 4. Able to work with classification and clustering algorithms.								
CourseOutcomes:Aftersuccessfulcompletionofthecourse,thestudentwillbeableto:								
CO1	Create python programs on Numpy, pandas, MatplotLib and Plotly.							
CO2	Writepythonbasicprograms usingregression.							
CO3	Applypython control structures for classification techniques.							
CO 4	Implement programsonclustering techniques using python.							

CO-POMapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	3	2										3	3
CO2	2	1	3										1	1
CO3	1	1	1	2									1	1
CO4	2	3	3		1								3	3

COURSECONTENT
TASK–1
1. (a)PythoninstallationforWINDOWS (b)Installation of Jupyter Notebook 2. Practising Numpy (a) Write a Numpy program to add a border filled with 0's around the existing array. (b) Write a Numpy program to get the unique elements of an array. (c) Write a Numpy program to get the values and indices of the elements that are bigger than10 in a given array.
TASK-2
3. Pandas (a) Write a pandas program to create and display a dataFrame from a specified dictionary data which has the index labels. (b) Write a pandas program to select the rows where the score is missing, i.e. is NaN.
TASK- 3
4. MatplotLib a) Write a Python program to draw a scatter plot with empty circles taking a random distribution in X and Y and plotted against each other. **b)** Write a Python program to create a pie chart with a title of the popularity of programming

languages.
TASK– 4
5. (a) Install Plotly (b) Create Line Chart, Bar Chart, Pie Charts using Plotly. (c) Create Box Plots, Violin Plots, Heatmaps using Plotly.
TASK- 5
6. (a) Develop the model Simple Linear regression with Python. (b) Develop the model Multiple Linear regression with Python.
TASK- 6
7.Write a program to implement Logistic Regression. 8.Write a program to implement the Decision Tree Regression model.
TASK- 7
9.Write a program to implement the Random Forest Classification model.
TASK – 8
10.Write a program to implement the K-Nearest Neighbor algorithm to classify the given dataset.
TASK – 9
11.Write a program to implement the Naïve Bayesian classifier for a simple training data set stored as a .CSV file.
TASK– 10
12.Write a program to implement the k-Means clustering algorithm to cluster the set of data stored in .CSV file.

Total Hours:	**48Hours**

Self-Study:

Contentstopromoteself-Learning:

SNO	Topic	CO	Reference
1	Pythoninstallation	CO1	https://www.javatpoint.com/how-to-install-python
2	Data analysis with python	CO2	https://youtu.be/r-uOLxNrNk8
3	Data Science NPTEL	CO3	https://youtu.be/fn1rKKNLuzk
4	Classification	CO4	https://youtu.be/vz_xuxYS2PM https://youtu.be/6kZ-OPLNcgE
5	Clustering	CO5	https://youtu.be/1XqG0kaJVHY

TextBook(s):

1. Python Programming – An Introduction to computer science, John Zelle,JimLeisy

2. Programming and Problem Solving with Python by Ashok NamdevKamthane and Amit Ashok

Kamthane, McGraw Hill Education; First edition (1 November 2017)

ReferenceBook(s):

1. Programming Python, Mark Lutz, O'Reilly, 3rd Edition, 2006
2. Core Python Programming, Wesley J Chun, PH, 2nd Edition
3. Python Programming: A Compatible Guide for Beginners to Master and Become an Expert in python programming Language, Brain Draper, CreateSpace Independent Publishing Platform, 2016

Online/WebResources:

1. http://www.freebookcentre.net/Language/Free-Python-Books-Download.html
2. https://www.pdfdrive.com/python-programming-books.html
3. https://nptel.ac.in/courses/106/106/106106182/
4. https://www.javatpoint.com/python-tutorial
5. https://www.python.org/about/gettingstarted/
6. https://www.tutorialspoint.com/python/index.htm

NARAYANA ENGINEERING COLLEGE:NELLORE								
21MC211	LINUX PROGRAMMING							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-requisite: "Operating Systems"

Course Objectives:

1. To Explore Unix Operating system & Explore commands to work with files and directories
2. To know about basic Shell scripting.& Solve Advanced C and Shell Script Programming problems in Linux Environment.
3. Memory to develop inters Process communication in Linux.
4. Understand of Golden rules in developing user interface
5. Understand of Testing Principles in Software environment

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	**Identify** the best suitable **Process Methodology** for developing a quality oriented software solution**.(BL-2)**
CO 2	**Sketch** the **requirements analysis model** for a project work by using various modelling diagrams**.(BL-3)**
CO 3	**Applythe standard design principles** and select the suitable architectural styles for given specifications**.(BL-3)**
CO 4	**Demonstratestandard Golden rules** for developing the user interface**.(BL-2)**
CO 5	**Applying** of **Testing principles** on software project**.(BL-3)**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	3	3										2	
CO2	2		2							2				
CO3		3		2									2	
CO4	2			2	1							1		
CO5			3											2

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	Linux Utilities	10 H

Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities. Sed-Scripts, Operation, Addresses, Commands, Applications, awk- Execution, Fields and Records, Scripts, Operation, Patterns, Actions, Associative Arrays, String and Mathematical functions, System commands in awk, Applications.

At the end of the Module 1, students will be able to:

8. Learn Linux operating system basics. **(BL-2)**
9. Gain the knowledge on security and utilites. **(BL-2)**
10. Learn awk, sed commands usage in linux programming.**(BL-2)**

MODULE -2	Shell programming	10 H

Shell programming with Bourne again shell(bash)- Introduction, shell responsibilities, pipes and Redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts. Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

At the end of the Module 2, students will be able to:

1. Explore java inheritance. **(BL-2)**
2. Understand the concepts of interfaces and abstract classes. **(BL-2)**
3. Creating and accessing a package. **(BL-2)**

MODULE-3	Process concepts & Signals	10 H

Process – Process concept, Layout of a C program image in main memory, Process environment, environment list, environment variables, getenv, setenv, Kernel support for process, process identification, process hierarchy, process states, process control - process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process, system call interface for process management-fork, vfork, exit, wait, waitpid, exec family, system, I/O redirection, Process Groups, Sessions and Controlling Terminal, Differences between threads and processes.
Signals – Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions.

At the end of the Module 3, students will be able to:

11. Write the programs for file management using I/O streams. **(BL-2)**
12. Illustrate the importance of networking in java. **(BL-3)**
13. Write the programs on networking. **(BL-3)**

MODULE-4	Files and Directories	9 H

Files and Directories- File Concept, File types, File System Structure, file metadata-Inodes, kernel support for files, system calls for file I/O operations- open, create, read, write, close, lseek, dup2,file status information-stat family, file and record locking-lockf and fcntl functions, file permissions - chmod, fchmod, file ownership-chown, lchown, fchown, links-soft links and hard links – symlink, link, unlink.
Directories-Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir, seekdir, telldir functions.

At the end of the Module 4, students will be able to:

4. Handle the predefined exceptions. **(BL-2)**
5. How to create and handle the user defined exceptions. **(BL-2)**
6. Learn the concept of multithreading.**(BL-1)**

MODULE-5	Inter-process Communication& Semaphores	9 H

Inter-process Communication : Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, pipes-creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs (Named pipes), differences between unnamed and named pipes, popen and pclose library functions.
Message Queues- Kernel support for messages, Linux APIs for messages, client/server example.
Semaphores-Kernel support for semaphores, Linux APIs for semaphores, file locking with semaphores.

At the end of the Module 5, students will be able to:

1. What is the usage of IPC. **(BL-2)**
2. Explain the various inter process communication. **(BL-3)**
3. Learn about linux APIs for Message Queues, Semaphores. **(BL-2)**

Total hours:	**48 hours**

Content beyond syllabus:

1.Open source software Test Automation Tools

Self-Study: Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	**Linux Utilities**	CO1	https://infotricks1on1.blogspot.com/p/blog-page_3.html
2	**Shell programming with Bourne again shell**	CO2	https://www.tutorialspoint.com/unix/unix-using-variables.htm
3	**Process**	CO3	https://www.tutorialspoint.com/unix/unix-processes.htm
4	**Files and Directories**	CO4	https://www.geeksforgeeks.org/unix-file-system/
5	**Inter-process Communication**	CO5	https://www.geeksforgeeks.org/inter-process-communication-ipc/

Text Book(s):.

1. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH,2006.
2. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones,Wrox, Wiley India Edition,rp-2008.
3. Unix Network Programming, W.R.Stevens, PHI.
4. Unix and Shell programming, B.A.Forouzan and R.F.Gilberg, Cengage Learning.

Reference Book(s):

1. Linux System Programming, Robert Love, O‟Reilly, SPD, rp-2007.
2. Unix for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson Education, 2003
3. Unix shell Programming, S.G.Kochan and P.Wood, 3rd edition, Pearson Education.

Online Resources:

1. http://www.acadmix.com/eBooks_Download
2. http://www.freetechbook.com/software-engineering-f15.html

Web Resources:

1. http://www.nptel.iitm.ac.in/courses/Webcourse-contens/IITKharagpur/SoftEngg/
2. http://www.Computer.org/portal/wen/swebok
3. http://www.softwareengineerinsider.com/articles/what-is-software -engineering.html
4. http://www.tutorialspoint.com/software_engineering

NARAYANA ENGINEERING COLLEGE:NELLORE								
21MC212	OBJECT ORIENTED ANALYSIS AND DESIGN							R2021
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-requisite: Object oriented programming concepts.

Course Objectives:

1. To understand the concepts of object oriented system, unified approach.
2. To understand object oriented system development, methodologies.
3. To demonstrate UML diagrams.
4. To model user interface and map object oriented system to relational system.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	Define the concepts of object model.**(BTL-2)**
CO 2	Identify the classes and vocabulary of the problem domain. **(BTL-2)**
CO 3	Sketch the class and object diagrams for various applications. **(BTL-3)**
CO 4	Apply the basics of behavioural modelling to behavioural diagrams. **(BTL-3)**
CO 5	Sketch the model various components and deployment diagram for the applications**.(BTL-3)**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2			1								2	3	
CO2	2			1								2	3	2
CO3	2	2	3	2	2							2	3	2
CO4	2		3		2							2	3	2
CO5	2		3		2							2	3	

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	Introduction	7 H

Introduction: The structure of complex systems, the inherent complexity of software, attributes of complex system, organized and disorganized complexity, bringing order to chaos, designing complex systems, evolution of object model, foundation of object model, elements of object model, applying the object model.

At the end of the Module 1, students will be able to:

1. Understand the Generations of Programming Languages.**(BTL-2)**
2. Describe the Unified process phases. (**BTL-2)**
3. Compare the object oriented programming, Design and analysis. (**BTL-2)**
4. Summarize the elements of object Model. (**BTL-2)**

MODULE -2	Classes and Objects	7 H

Classes and Objects: The Nature of an Object, Relationships among Objects, The Nature of a Class, Relationships among Classes, The Interplay of Classes and Objects, The Importance of Proper Classification, Identifying Classes and Objects, Key Abstractions and Mechanisms.

At the end of the Module 2, students will be able to:

1. Identify the Nature of an Object, relationships among objects and classes. (**BTL-2)**
2. Identify the classes and objects to state model. (**BTL-2)**
3. Classify the general approaches to design of complex system. (**BTL-2)**

MODULE-3	Introduction to UML	6H

Introduction to UML: Why we model, Conceptual model of UML, Architecture, Classes, Relationships, Common Mechanisms, Class diagrams, Object diagrams

At the end of the Module 3, students will be able to:

1. the unified modeling language for writing software blueprint. (**BTL-2)**
2. Achieve the aims of Model to specify the structure and behavior of system. (**BTL-2)**
3. Illustrate the various artifact to modeling the different views of system architecture.(**BTL-2)**

MODULE-4	Structural Modeling	6H

Structural Modeling: Package Diagram, Composite structure Diagram, Component diagrams, Deployment diagrams, Profile Diagram.

At the end of the Module 4, students will be able to:

1. Classify the structural Modeling components. (**BTL-2)**
2. Compare the Basic structural and advanced structural Modelling. (**BTL-2)**
3. Draw the Interaction and activity diagram for various applications. (**BTL-3)**

MODULE-5	Behavioural Modeling	6H

Basic Behavioral Modeling: Use case diagrams, Activity Diagrams, state machines, sequence diagram, Communication diagram, Timing diagram, interaction overview diagram, Events and signals, processes and Threads.

At the end of the Module 5, students will be able to:

1. Classify the Behavioral Modeling components.(**BTL-2)**
2. Identify the mechanisms and frameworks that shape the architecture of yoursystem.(**BTL-3)**
3. Draw the interaction diagram for various applications. (**BTL-3)**

Total hours:32 Hours

Term work:

1. Develop the modelling of System Architecture: Satellite-Based Navigation.
2. Develop the modelling of Artificial Intelligence: Cryptanalysis.
3. Develop the modelling of Control System: Traffic Management.
4. Compare the static view , Design view, activity view and use case view.
5. Demonstrate the semantic responsibities and Notation responsibities.

Content beyond syllabus:

1. Forward & Reverse Engineering of all UML diagrams.

Self-Study:

Contents to promote self-Learning:

SNO	Topic	Reference
1	Elements of the Object Model	http://www.digimat.in/nptel/courses/video/106105153/L16.html
2	Classes and objects	https://www.youtube.com/watch?v=tWIe9E4SWQo
3	Class diagram	https://www.youtube.com/watch?v=UI6lqHOVHic
4	Use case diagram	https://www.lucidchart.com/blog/types-of-UML-diagrams
5	Uml sequence diagram	https://www.lucidchart.com/pages/how-to-draw-a-sequence-diagram-in-UML
6	Activity diagram	https://www.smartdraw.com/activity-diagram/

Text Book(s):

1. "Object- Oriented Analysis And Design with Applications", Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, PEARSON, 3rd edition, 2013.
2. "The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, PEARSON 12th Impression, 2012.

Reference Book(s):

1. "Object-oriented analysis and design using UML", Mahesh P. Matha, PHI
2. "Head first object-oriented analysis and design", Brett D. McLaughlin, Gary Pollice, Dave West, O'Reilly
3. "Object-oriented analysis and design with the Unified process", John W. Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning
4. "The Unified modeling language Reference manual", James Rumbaugh, Ivar Jacobson, Grady Booch, Addison-Wesley

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105153/
2. http://www.digimat.in/nptel/courses/video/106105153/L51.html

Web References:

1. https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_tutorial.pdf
2. https://www.geeksforgeeks.org/unified-modeling-language-uml-introduction/
3. https://www.smartdraw.com/uml-diagram/

OBJECTORIENTEDANALYSISANDDESIGNLAB

Task 1: Developing UML Diagrams for ATM System

UMLdiagrams to bedeveloped are:

1. UseCaseDiagram.
2. ClassDiagram.
3. SequenceDiagram.
4. CollaborationDiagram.
5. StateDiagram
6. ActivityDiagram.
7. ComponentDiagram
8. DeploymentDiagram.
9. TestDesign.

Task 2: Banking System

Listof TasksforwhichstudentshavetodesignallUMLdiagrams

Task 3: Onlinebookshopsystem

Listof TasksforwhichstudentshavetodesignallUMLdiagrams

Task 4: Universitysystem

Listof TasksforwhichstudentshavetodesignallUMLdiagrams

Task 5: Library Management System

Listof TasksforwhichstudentshavetodesignallUMLdiagrams

Task 6: Hospital Management System

Listof TasksforwhichstudentshavetodesignallUMLdiagrams

Total hours: 32 Hours

Text Book(s):

1. "Object- Oriented Analysis And Design with Applications", Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, PEARSON, 3rd edition, 2013.
2. "The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, PEARSON 12th Impression, 2012.

Reference Book(s):

1. "Object-oriented analysis and design using UML", Mahesh P. Matha, PHI
2. "Head first object-oriented analysis and design", Brett D. McLaughlin, Gary Pollice, Dave West, O'Reilly

NARAYANA ENGINEERING COLLEGE: NELLORE								
21MC213	E-COMMERCE							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-requisite: NIL

Course Objectives:

- To understand about the need of e-commerce in digital environment
- To learn about the various prospects of broad band communications in networks
- To know about the Need of firewalls in e-commerce for a secured environment
- Importance of encryption and different methods of encryption in networks
- To understand about the e-payments using credit and debit cards

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	**Memorize** about the **E-commerce** and need of E-commerce**(BL-1)**
CO 2	**Demonstrate** about the different **broad band telecommunications in Internet(BL-2)**
CO 3	**Analyze** about the **Firewalls** and its importance in security environment**(BL-3)**
CO 4	**Illustrate** about the encryption and **different types of encryption** in networks**(BL-2)**
CO 5	**Summarize** about the electronic payments and **protection in e-payments(BL-2)**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2											2	1
CO2	2	2	2										1	1
CO3	2	1	2										1	1
CO4	2	2											2	
CO5	2	1	2										2	

COURSE CONTENT

MODULE – 1	INTRODUCTION	10H

Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.

At the end of the Module 1, students will be able to:

1. To understand about the E-commerce in digital environment.**(BL-2)**
2. To Learn about the basics of E-commerce.**(BL-2)**
3. Able to learn about the different prospects of e-commerce.**(BL-2)**

MODULE -2	NETWORK INFRASTRUCTURE FOR E- COMMERCE	10H

Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN,

FRAME RELAY). Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.		
At the end of the Module 2, students will be able to: 1. To learn about the basics of internet and Intranet services**(BL-2)** 2. To understand about the different Broad band Communications**(BL-2)** 3. To understand about the different wireless protocols**(BL-2)**		
MODULE-3	**WEB SECURITY**	**9H**
Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design Limitation of Firewalls.		
At the end of the Module 3, students will be able to: 1. To analyze about the need of firewalls in Networks**(BL-3)** 2. To know about the different security threats in Networks**(BL-2)** 3. To understand about the advantages and disadvantages of Firewalls**(BL-2)**		
MODULE-4	**ENCRYPTION**	**10H**
Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures, Virtual Private Network.		
At the end of the Module 4, students will be able to: 1. To understand about the Encryption Techniques**(BL-2)** 2. To know about the different Security keys used in Encryption**(BL-2)** 3. To implement public keys and privates keys in digital signatures**(BL-3)**		
MODULE-5	**ELECTRONIC PAYMENTS**	**9H**
Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card-based EPS, online Banking.EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.		
At the end of the Module 5, students will be able to: 1. Describe the importance of SET protocol**(BL-2)** 2. Understand about the E-Payments in E-Commerce**(BL-1)** 3. Able to analyze about the credit and debit transactions based on EPS**(BL-3)**		
Total Hours:		**48HOURS**

Content beyond syllabus:Digital Economy, E-Banking System, EFT-Electronic Funds Transfer
Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	E-Commerce Technology	CO1	https://www.geeksforgeeks.org/e-commerce/
2	Broad Band Tele communications	CO2	https://www.geeksforgeeks.org/difference-between-broadband-and-dsl/
3	Transaction Security	CO3	https://www.javatpoint.com/security-threat-to-e-commerce
4	Encryption Techniques	CO4	https://www.javatpoint.com/what-is-encryption
5	SET Protocol	CO5	https://www.geeksforgeeks.org/secure-electronic-transaction-set-protocol/

Text Book(s):

5. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.
6. Pete Lohsin , John Vacca "Electronic Commerce", New Age International.

Reference Book(s):

1. Goel, Ritendra "E-commerce", New Age International
2. Laudon, "E-Commerce: Business, Technology, Society", Pearson Education
3. Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH
4. Turban, "Electronic Commerce 2004: A Managerial Perspective", Pearson Education

Online /Web Resources:

1. https://www.geeksforgeeks.org/e-commerce/
2. https://www.javatpoint.com/
3. https://www.tutorialspoint.com/e_commerce/index.htm
4. https://www.freebookcentre.net/business-books-download/E-Commerce-Notes.html
5. http://ebooks.lpude.in/computer_application/bca/term_6/DCAP306_DCAP511_E-COMMERCE_AND_E-BUSINESS.pdf

SEMESTER- III

Subject Code	Course Title		
21MC301	Design and analysis of Algorithms		
21MC302	Computer Networks		
21MC303	Artificial Intelligence		
21MC304	Web Technologies		
-	Professional Elective – II	21MC310	1. Big Data Analytics
		21MC311	2. Software Architecture
		21MC312	3.Data Warehousing and Data Mining
-	Professional Elective –III	21MC313	4.Mobile Application Development
		21MC314	5.Software Project Management
		21MC315	6.Machine Learning
21MC305	Computer Networks Lab		
21MC306	Artificial Intelligence Lab		
21MC307	Web technologies Lab		
21MC308	Career Competency Development Program -III		
21MC309	Industry Oriented Course		

NARAYANAENGINEERINGCOLLEGE:NELLORE								
21MC301	DESIGN&ANALYSISOFALGORITHMS							R21
Semester	Hours/ Week			Total hrs	Credit	MaxMarks		
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

Pre-requisite:CProgramming&Datastructures

CourseObjectives:

- Toknowtheimportanceofthespaceandtimecomplexityofagivenalgorithm.
- Tostudyvariousalgorithmdesigntechniquesandimplementation.
- Toutilizedatastructuresand/oralgorithmicdesigntechniquesinsolvingnewproblems.
- UnderstandofLowerBound theoryand implementationtechniquesof it
- Toknowand understandbasiccomputabilityconceptsandthecomplexityclassesP,NP,andNP-Complete.

CourseOutcomes:Aftersuccessfulcompletionofthecourse,thestudentwillbeableto:

CO1	Analyzethecomplexities ofalgorithmsanddesignofalgorithms and Divide and conquer strategy**(BL-4)**
CO 2	Use techniques Greedy, Dynamic Programming, Backtracking,BranchandBoundtosolvetheproblems.**(BL-3)**
CO 3	Analyzecriteriaandspecificationstonewproblems,andchoosetheappropriatealgorithmicdesigntechniquetosolvethesolution. **(BL-4)**
CO 4	Illustrate the worst-case time complexity of an algorithm is defined, howasymptoticnotationisusedtoprovidea roughclassificationofalgorithms.**(BL-2)**
CO 5	AbletoidentifythatacertainproblemisNP-CompleteorNPHard**(BL-3)**

CO-POMapping

CO	PO												PSO	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1		3											
CO2	2	1	2											2
CO3	1	3	1	1										
CO4	3	3	2		1									
CO5	1		2		1									

1:Low, 2-Medium,3-High

COURSECONTENT		
MODULE – 1	**Introduction & Divide and Conquer**	**10 H**

Introduction:WhatisanAlgorithm,Algorithmspecification,Performanceanalysis,Typesofalgorithmstrategies,AsymptoticNotations,PerformanceMeasurement,PerformanceAnalysis,AmortizedAnalysis

DivideandConquer: DivideandconquerBasicMethodStrategy,BinarySearch,Findingthemaximum and minimum, Merge sort, Quick Sort, Selection sort, Strassen's matrix multiplication

AttheendoftheModule1,studentswill beableto:

1. Learn about different types of algorithms for problems**(BL-2)**
2. AbletoidentifythePerformanceanalysisofanalgorithm**(BL-2)**
3. ImplementationofDivideandConquerStrategy**(BL-3)**

MODULE -2	**Greedy Method and Dynamic Programming**	**10 H**

GreedyMethod:Generalmethod,Knapsackproblem,JobSchedulingwithDeadlines,MinimumcostSpanningTrees,Optimalstorage ontapes,Single-source shortestpaths. **Dynamicprogramming:**GeneralMethod,Multistagegraphs,All-pairsshortestpaths,Optimalbinary searchtrees, 0/1Knapsack, The travellingsalespersonproblem		
AttheendoftheModule2,studentswill beableto: 1. Importance of greedy algorithm where it is implemented **(BL-2)** 2. Dynamic programming role in algorithms evolution**(BL-3)** 3. Different problems on Greedy approach and Dynamic Programming**(BL-2)**		
MODULE-3	**Basic Traversal & Search Techniques, Back Tracking**	**9 H**
BasicTraversalandSearchTechniques:Techniquesforbinarytrees,TechniquesforGraphs,Connectedcomponents andSpanningtrees,Bi-connectedcomponents andDFS **Backtracking:**GeneralMethod,8–queensproblem,Sumofsubsetsproblem,Graphcoloringand Hamiltoniancycles,KnapsackProblem		
AttheendoftheModule3,studentswill beableto: 1. AnalysisofGraphsandimplementation ofgraphs**(BL-4)** 2. ImplementationofBackTrackingApproach**(BL-3)** 3. AnalyzingofcomplexAlgorithms**(BL-4)**		
MODULE-4	**Branch and Bound & Lower Bound Theory**	**9 H**
BranchandBound: Themethod,Travellingsalesperson,0/1Knapsackproblem,EfficiencyConsiderations,LIFOBranchandBoundSolution,FIFOBranchandBoundSolution,LCSearchBranchandBound Solution.		
AttheendoftheModule4,studentswill beableto: 1. ImplementationofBranchandBoundStrategyonProblems**(BL-3)** 2. DifferenttypesofBranchandBoundApproach**(BL-2)** 3. Solve problems by using BranchandBoundApproach**(BL-3)**		
MODULE-5	**Lower Bound Theory & P,NP,NP Hard & NP Complete**	**10 H**
NP – Hard and NP – Complete Problems: NP Hardness, NP Completeness, Consequences of being inP,Cook‘sTheorem,ConvexHullAlgorithm,CliqueDecisionProblem,VertexCoverProblem ,ReductionSourceProblems,Reductions:Reductionsforsomeknownproblems		
AttheendoftheModule5,studentswill beableto: 1. DifferencebetweenP,NP,NP-Hard,NP-Complete**(BL-2)** 2. Reductionanditsimportanceinsolvingproblems**(BL-2)** 3. Understand about Deterministic and Non Deterministic Problems **(Bl-2)**		
	Totalhours:	**48hours**

Contentbeyondsyllabus:
1.ApproximationandDifferenttypesofApproximation2.Satisfiability 3.ConjunctiveNormalForm

Self-Study:

Contentstopromoteself-Learning:

SNO	Topic	Reference
1	**Divideand Conquer**	https://www.tutorialspoint.com/data_structures_algorithms/divide_and_conquer.htm
2	**Greedy algorithms**	https://www.tutorialspoint.com/data_structures_algorithms/divide_and_conquer.htm
3	**0/1knapsack Problem**	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_01_knapsack.htm
4	**Travelling Salesman problem**	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_travelling_salesman_problem.htm
5	**NPHardandNPComplete**	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_np_hard_complete_classes.htm

TextBook(s):

1. "Fundamentals of Computer Algorithms", Ellis Horowitz, S. Satraj Sahani and Rajasekhran, 2nd edition, University Press.2014,
2. "Design and Analysis of Algorithms", Parag Himanshu Dave, Himanshu Bhalchandra Dave, Pearson Education, Second Edition, 2009.

ReferenceBook(s):

1. Introduction to Algorithms", second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, PHI Pvt. Ltd./ Pearson Education.
2. "Introduction to Design and Analysis of Algorithms A strategic approach", R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Mc Graw Hill.
3. "Data structures and Algorithm Analysis in C++", Allen Weiss, Second edition, Pearson education.
4. "Design and Analysis of algorithms", Aho, Ullman and Hopcroft,Pearson education.
5. "Algorithms" – Richard Johnson baugh and Marcus Schaefer, Pearson Education

Online/WebResources:

1. https://www.pdfdrive.com/horowitz-and-sahani-fundamentals-of-computer-algorithms-2nd-edition-d18723362.html
2. https://www.worldcat.org/title/design-and-analysis-of-algorithms/oclc/754014154/https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3. https://www.javatpoint.com/daa-tutorial
4. https://www.vidyarthiplus.com/vp/Thread-CS6402-Design-and-Analysis-of-Algorithms--38558

NARAYANA ENGINEERING COLLEGE::NELLORE							
21MC302	COMPUTER NETWORKS						R21
Semester	Hours / Week			Total hrs	Credit	Max Marks	
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

Pre-requisite: Knowledge of Information Technology, Computer Organization & Architecture

Course Objectives:

1. To impart the core principles of Information Communication Technology.
2. To deliver background information on the key transmission technologies used in computer networks.
3. To convey dimensions of Network layer through Internet Protocol.
4. To provide an insight into the most widely used Transport Layer protocols
5. To teach the principles of Application Layer and its protocols.

Course Outcomes: On successful completion of the course,student will be able to:

CO 1	Choose suitable transmission media depending on the requirements.(BL-2)
CO 2	Determine the errors in data transfer between source and destination. (BL-3)
CO 3	Obtain the skills of subnetting and routing mechanisms. (BL-2)
CO 4	Illustrate reliable, unreliable communication on public networks. (BL-3)
CO 5	Demonstrate the elements of socket programming, principles of protocols. (BL-3)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2											1	
CO2	2	2	3	3									3	3
CO3	2	3	2										1	2
CO4	2	1											1	
CO5	2	1	1										1	1

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE - 1	Physical Layer	(10H)

Data Communications, Networks, Network Types, Internet History, Standards and Administration, Protocol Layering, TCP/IP Protocol Suite, The OSI Model.Data and Signals, Digital Signals, Transmission Impairment, Data Rate Limits, Performance.TransmissionMedia:Introduction, Guided Media, Unguided Media

At the end of the Module 1, students will be able to:

1. Understand the basics of computer networks. (BL-2)

2. Describe the picture of data communication with layered architecture. (BL-2) 3. Describe performance issues in data transmission. (BL-2) 4. Classify the elements of physical media used for data transmission. (BL-2)		
MODULE –2	**Data-Link Layer & MAC**	**(9H)**
Introduction, Link-Layer Addressing, Error Detection and Correction: Cyclic Codes,Checksum, Forward Error Correction, Data Link Control (DLC)**:**DLC Services, Data-Link Layer Protocols, Sliding Window Protocols, HDLC, PPP.MAC: Random Access.		
At the end of the Module 2, students will be able to: 1. Explain link layer services. (BL-2) 2. Discuss Error Detection and Correction mechanisms. (BL-2) 3. Describe Data Link Control services and protocols. (BL-2) 4. Illustrate Media Access Control Protocols. (BL-3)		
MODULE –3	**Network Layer**	**(10H)**
Network Layer:Network Layer Design Issues, Routing Algorithms: The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector, Link State, Hierarchical, Broadcast, Multicast, Anycast,Congestion Control Algorithms, Quality of Service. Internetworking, IPV4 Addresses, IPV6, OSPF, BGP, IP.		
At the end of the Module 3, students will be able to: 7. Understand design issues of network layer. (BL-2) 8. Explain efficient routing protocols in computer networks. (BL-2) 9. Discuss the concept of internetworking and its implementation issues. (BL-2) 10. Describe the elements of network layer required for data transfer over Internet. (BL-2)		
MODULE –4	**Transport Layer**	**(9H)**
The Transport layer services, Elements of Transport Protocols, Congestion Control in Transport Layer. UDP, TCP,Performance problems in computer networks, Network performance measurement, Real-time interactive protocols.		
At the end of the Module 4, students will be able to: 1. Understand the services provided by transport layer. (BL-2) 2. Describe elements of transport layer required for data transfer over Internet. (BL-2) 3. Demonstrate end to end communication. (BL-3) 4. Discuss performance issues in transport layer. (BL-2)		
MODULE –5	**Application Layer**	**(10H)**
Introduction, Client Server Programming-Iterative communication using UDP, Iterative communication using TCP.Standard Client Server Protocols:WWW, HTTP, Domain Name System, FTP, e-mail, TELNET, Secure Shell.		
At the end of the Module 5, students will be able to: 1. Implement client server communication. (BL-3) 2. Explain the working of world wide web with HTTP, DNS. (BL-2) 3. Describe the protocols for mail, remote system login. (BL-2) 4. Discuss file transfer, network management protocols. (BL-2)		
	Total hours:	**48 hours**

Content beyond syllabus:

1. Wired LANs (Ethernet Family), Wireless LANs (802.11 Family)
2. Connecting Devices and VPN
3. Peer-to-Peer paradigm

Self-Study:

Contents to promote self-Learning:

S.No.	Module	Reference
1.	Physical Layer	https://nptel.ac.in/courses/106/105/106105183/ Lecture - 3
2.	Data link layer	https://nptel.ac.in/courses/106/105/106105183/ Lecture – 46,47,48,49,50
3.	Network Layer	https://nptel.ac.in/courses/106/105/106105183/ Lecture – 26, 27, 28, 29, 30
4.	Transport Layer	https://nptel.ac.in/courses/106/105/106105183/ Lecture – 11,12,13,14,15
5.	Application Layer	https://nptel.ac.in/courses/106/105/106105183/ Lecture – 5, 6, 7, 8, 9, 10

Text Book(s):

1. Data communications and networking, Behrouz A. Forouzan, 5th edition, McGraw Hill Education, 2012.
2. Computer Networks, Andrew S. Tanenbaum, Wetherall, 5th edition, Pearson, 2013.

Reference Book(s):

1. Douglas E. Comer, Internetworking with TCP/IP – Principles, protocolsand architecture-Volume 15th edition, PHI.
2. Kurose James, Ross Keith, Computer Networking: A Top-Down Approach, 6th Edition, Pearson Education
3. Fall, Richard, TCP/IP Illustrated: The Protocols, 2ND edition, Pearson Education
4. Behrouz A. Forouzan, TCP/IP Protocol Suite, 4th edition, Tata McGraw Hill
5. BhushanTrivedi, Data Communication and Networks, Oxford,2016.
6. Davie, Elsevier,Computer Networks, 5th Edition, Peterson.
7. M. Dave, Computer Networks, Cengage Learning,2012.

Online Resources/ Web References:

1. https://www.coursera.org/learn/tcpip
2. https://www.youtube.com/watch?v=aHJElrgj6UA&list=PLBbU9-SUUCwVmwRswAHdqoJw-D2WeD9CN
3. https://www.youtube.com/watch?v=vrh0epPAC5w&list=PL1kr2FHR_uFHQk2hy2g8lr7ouBhSJFEk_
4. https://www.youtube.com/watch?v=flDzURAm8wQ&list=PL6gx4Cwl9DGBI2ZFuyZOl5Q7sptR7PwYN
5. https://www.geeksforgeeks.org/computer-network-tutorials/

NARAYANAENGINEERINGCOLLEGE:NELLORE								
21MC303	ARTIFICIALINTELLIGENCE							R21
Semester	Hours/Week			Total hrs	Credit	MaxMarks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-requisite:OOP Languages like java and python

CourseObjectives:

1. To Learn about basic AI fundamentals and AI problems.
2. To understanding about searching.
3. To implement AI game playing concepts.
4. To Understand about AI knowledge
5. To describe AI order logic

CourseOutcomes:Aftersuccessfulcompletionofthe course,thestudentwillbeableto:

CO1	Describe applications of Artificial Intelligence.(BL-2)
CO2	Evaluate problem solving strategies in AI.(BL-3)
CO3	Illustrate problem reduction techniques.(BL-2)
CO4	List the logic concepts.(BL-2)
CO5	Analyze the current knowledge representation techniques in AI.(BL-3)

CO-POMapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	2	1	3										3	
CO2	3	1	2										2	1
CO3	2	2	3	1									2	2
CO4	1	2		3	2								1	
CO5	1	1	2											2

1:Low,2-Medium,3-High

COURSECONTENT

MODULE – 1	Introduction to Artificial Intelligence	10H

Introduction To Artificial Intelligence: Introduction ,history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

Problem Solving: State-Space Search And Control Strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative- deepening a*, constraintsatisfaction.

At the end of the Module 1, students will be able to:

1. Analyze the components of State applications of Artificial Intelligence
2. Understand the use various Problem solving.

3. Understanding about searching.

MODULE - 2	Problem Reduction and Logic Concepts	10H

Problem Reduction And Game Playing: Introduction, problem reduction, game playing, alpha- beta pruning, two-player perfect informationgames.

Logic Concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

Attheend oftheModule2,studentswillbeableto:

1. understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs.
2. IdentifytheuseofLogicconcepts.

MODULE – 3	Knowledge Representation and Techniques	9H

Knowledge Representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced Knowledge Representation Techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semanticweb.

AttheendoftheModule3,studentswillbeableto:

1. AnalyzetheAIknowledge
2. Understandtheuse ofAdvancedknowledgerepresentationtechniques.

MODULE – 4	Artificial neural networks	10H

Artificial neural networks: Introduction, artificial networks, single layer feed forward networks, multi layered forward networks, design issues of artificial neuralnetworks.

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory.

AttheendoftheModule4,studentswillbeableto:

1. UnderstandthevariousInvestigatevariousexpertsystems
2. IdentifytheuseExpertsystemapplications.

MODULE – 5	Fuzzy Logic and ML paradigms	9H

Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzysystems

Machine learning paradigms: Introduction, machine learning systems, supervised and unsupervised learning's, inductive learning, deductive learning, clustering, support vector machines, case based reasoning and learning.

AttheendoftheModule5,studentswillbeableto: 1. Analyzethedifferentprobabilitytheory. 2. IdentifytheFuzzysetsandfuzzylogic
Totalhours: **48hours**
Term work: proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language

Contentbeyondsyllabus:

1. CloudDatasecurityusingcryptographictechniques.

Self-Study: Contentstopromoteself-Learning:

SNO	Topic	CO	Reference
1	State applications ofArtificialIntelligence	CO 1	https://www.youtube.com/watch?v=VNRmsACNSaY
2	Enumerateproblemsolvingstrategiesi nAI	CO 2	https://www.youtube.com/watch?v=1CsC5aa0Zek
3	Illustrateproblemreductiontechniques	CO 3	https://www.youtube.com/watch?v=d7EI8B7jTrI
4	Listthelogicconcepts	CO 4	https://www.youtube.com/watch?v=KWxTx7JlWLo
5	Analyzethecurrentknowledgerepresentation TechniquesinAI	CO 5	https://www.youtube.com/watch?v=WEqY5kRk-g0

TextBook(s):

1. Artificial Intelligence- SarojKaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nd ed, Stuart Russel, Peter Norvig, PEA

ReferenceBook(s):

1. Artificial Intelligence- Rich, Kevin Knight,Shiv Shankar B Nair, 3rd ed, TMH
2. IntroductiontoArtificialIntelligence,Patterson,PHI
3. Artificialintelligence,structuresandStrategiesforComplexproblemsolving,-GeorgeFLugar,5th ed, PEA
4. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
5. ArtificialIntelligence,AnewSynthesis,NilsJNilsson,Elsevier

OnlineResources:

1. https://nptel.ac.in/courses
2. https://freevideolectures.com/university/iitm

Web Resources:

1. https://www.youtube.com/watch?v=VNRmsACNSaY
2. https://www.youtube.com/watch?v=1CsC5aa0Zek
3. https://www.youtube.com/watch?v=d7EI8B7jTrI
4. https://www.youtube.com/watch?v=KWxTx7JlWLo
5. https://www.youtube.com/watch?v=WEqY5kRk-g0
6. https://www.youtube.com/watch?v=NLeWaH6O-TE

NARAYANA ENGINEERING COLLEGE:NELLORE							
21MC304	WEB TECHNOLOGIES						R21
Semester	Hours / Week			Total hrs	Credit	Max Marks	
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

Pre-requisite: A Course on "Web technologies".

Course Objectives:

1. Understand the process to develop dynamic web pages using HTML, CSS
2. Understand Client-side scripting with Javascript
3. Understand PHP language for server-side scripting.
4. Understand server-side scripting with PHP language
5. Understand what is XML and how to parse and use XML Data with Java

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	gain knowledge to develop dynamic web pages using HTML, CSS**(BL-2)**
CO 2	Learn the basics of Java Script**(BL-2)**
CO 3	Demonstrate server-side scripting with PHP language**(BL-2)**
CO 4	gain knowledge of server-side scripting, validation of forms**(BL-2)**
CO 5	Working with XML and processing of XML Data .**(BL-3)**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1												2
CO2	2	2	1										1	1
CO3	3	1	2	2	1								2	
CO4	2	2	2	1									2	1
CO5	1	2	2										1	2

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	HTML & CSS	10 H

HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, HTML styles, Elements, Attributes, Heading, Layouts, HTML media, Iframes Images, Hypertext Links, Lists, Tables, Forms, GET and POST method, HTML 5, Dynamic HTML.

CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution, CSS3, Web Servers- Apache, IIS, Bundle Servers.

At the end of the Module 1, students will be able to:

11. **Learn** basic HTML tags. **(BL-2)**
12. **Gain** the knowledge on HTML styles**. (BL-2)**
13. **Describe** Levels of Style Sheets. **(BL-2)**

MODULE -2	Java Script	10 H

Java script: Introduction to Java script, Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions, Exception Handling, Validation, Built-in objects, Event Handling, DHTML with JavaScript., DOM Model

Angular Java Script: Introduction to Angular JS Expressions: ARRAY, Objects, Strings, Angular JS Form Validation & Form Submission.

At the end of the Module 2, students will be able to:

1. **Learn** the basic concepts of java script**(BL-2)**
2. **Demonstrate** the concepts of Angular Java Script**. (BL-2)**
3. **Handling** Form Validation & Form Submission**. (BL-3)**

MODULE-3	PHP	10 H

Introduction to PHP: The problem with other Technologies (Servelets and JSP), Downloading, installing, configuring PHP, Programming in a Web environment and The anatomy of a PHP Page.

Overview of PHP Data types and Concepts: Variables and data types, Operators, Expressions and Statements, Strings, Arrays and Functions.

At the end of the Module 3, students will be able to:

14. **Learning** the concepts of PHP . **(BL-2)**
15. **Illustrate** the importance of Programming in a Web environment. **(BL-2)**
16. **Demonstrate** PHP Data type. **(BL-2)**

MODULE-4	PHP Advanced Concepts	9 H

PHP Advanced Concepts: Using Cookies, Using HTTP Headers, Using Sessions, authenticating users, Using Environment and Configuration variables, Working with Date and Time.

Creating and Using Forms: Understanding Common Form Issues, GET vs. POST, validating form input, working with multiple forms, and Preventing Multiple Submissions of a form.

At the end of the Module 4, students will be able to:

11. **Handling** Cookies. **(BL-3)**
12. **Create** and handle Forms. **(BL-3)**
13. **Preventing** multiple submissions of a form. **(BL-3)**

MODULE-5	XML & Node.js	9 H

Working with XML: Document type Definition (DTD), XML schemas, XSLT, Document object model, Parsers - DOM and SAX. News Feed (RSS and ATOM).

Node.js: Introduction, Advantages, Node.js Process Model, Node JS Modules, Node JS File system, Node JS URL module, Node JS Events.

Total hours:	**48 hours**

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	HTML & CSS	CO1	**https://www.w3schools.com/html/html_css.asp**
2	Java Script	CO2	**https://www.w3schools.com/js/js_intro.asp**
3	PHP	CO3	**https://www.tutorialspoint.com/php/index.htm**
4	PHP Advanced Concepts	CO4	**https://www.phptpoint.com/advanced-php-tutorial/**
5	XML & Node.js	CO5	**https://www.javatpoint.com/what-is-xml**

Text Book(s):

1. Programming the World Wide Web, Robet W Sebesta, 7th Edition, Pearson, 2013
2. Web Technologies, Uttam K Roy, 1stEdition ,7th impression, Oxford, 2012

Reference Book(s):

1. Deitel and Deitel and Nieto, Internet and World Wide Web - How to Program, , 5th Edition, Prentice Hall, 2011.
2. ELad Elrom, Pro Mean Stack Development, 1st Edition, Apress O'Reilly, 2016
3. David sawyer mcfarland, Java Script & jQuery the missing manual, 2nd Edition, O'Reilly, 2011
4. Peter Pollock, Web Hosting for Dummies, 1st Edition, John Wiley & Sons, 2013
5. Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens, PHP 5 Recipes A problem Solution Approach.
6. Tom Christiansen, Jonathan Orwant, Programming Perl, 4th Edition, O'Reilly, 2012
7. Kogent L S, Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech, 2009
8. Paul S Wang, Sanda S Katila, An Introduction to Web Design, Programming, 1st Edition, Cengage Learning, 2003

Online Resources:

1. https://www.geeksforgeeks.org/web-technology/

Web Resources:

1. https://www.w3schools.com/html/
2. https://www.w3schools.com/html/html_iframe.asp
3. https://www.w3schools.com/nodejs/

NARAYANAENGINEERINGCOLLEGE:NELLORE								
21MC305	COMPUTER NETWORKS LAB							R21
Semester	Hours/ Week			Total hrs	Credit	MaxMarks		
	L	T	P		C	CIE	SEE	TOTAL
III	0	0	3	48	1.5	40	60	100

Pre-requisite:Nil

CourseObjectives:

1. To Understand the functionalities of various layers of OSI model
2. To expose networking concepts using simple programs
3. To emulate client server architecture using different protocols
4. To illustrate different routing protocols and algorithms for reliable data transfer.

CourseOutcomes:Aftersuccessfulcompletionofthecourse,thestudentwillbeableto:

CO1	Define basic concepts of networking **(BL-3)**
CO2	Apply error detection control techniques**(BL-3)**
CO3	Apply packet routing techniques **(BL-3)**
CO 4	Develop Client Server programming **(BL-3)**

CO-POMapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	3	3											
CO2	2		2							2				
CO3		3		2										
CO4	1	1			1								1	

1:Low, 2-Medium,3-High

COURSE CONTENT	
TASK–1	**CO1**
1. To identify various devices available in campus. 2. To know the internet facility available in college	
TASK-2	**CO2**
1. Write a C program to implement the algorithm for parity method for error control. 2. Write a C program to implement the algorithm on hamming method for error correction (both single and block errors). 3. Write a C program to implement the algorithm for check sum computation	
TASK-3	**CO3**
1. Write a C program to implement the data link layer framing methods such as bit stuffing. 2. Write a C program to implement the data link layer framing method such as character stuffing. 3. Write a C program to implement data link layer framing method character count.	
TASK-4	**CO4**

1. Write a C program to implement on a data set characters the three CRC polynomials – CRC 12, CRC 16, and CRC CCIP.
TASK-5 CO3
1. Write a C program to Implement Dijkstra's Algorithm to compute the shortest path through a given path
TASK-6 CO4
1. Write a C program to take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm.
TASK – 7 CO3
1. Write a C program to implement the link state routing algorithm
TASK – 8 CO4
1. Write a C program Implement Broadcast Tree for a given subnet hosts
TASK – 9 CO3
1. Write a program for File Transfer in client-server architecture using TCP/IP
TASK – 10 CO3
1. A Client Server application for chat.
Totalhours: 48hours

TextBook(s):

1. "Data communications and networking", Behrouz A. Forouzan, Mc Graw Hill Education, 5th edition, 2012.
2. "Computer Networks", Andrew S. Tanenbaum, Wetherall, Pearson, 5th edition, 2010.

ReferenceBook(s):

1. Data Communication and Networks, Bhushan Trivedi, Oxford
2. "Internetworking with TCP/IP – Principles, protocols, and architecture- Volume 1, Douglas E. Comer, 5th edition, PHI
3. "Computer Networks", 5E, Peterson, Davie, Elsevier.
4. "Introduction to Computer Networks and Cyber Security", Chawan- Hwa Wu, Irwin, CRC Publications.

Online/WebResources:

1. https://www.tutorialspoint.com/data_communication_computer_network/index.htm2.
2. https://www.geeksforgeeks.org/computer-network-tutorials/

NARAYANAENGINEERINGCOLLEGE: NELLORE								
21MC306	ArtificialIntelligenceLab							R21
Semester	Hours/ Week			Total hrs	Credit	MaxMarks		
	L	T	P		C	CIE	SEE	TOTAL
III	0	0	3	48	1.5	40	60	100
Pre-requisite: AnyOOP ProgrammingLanguage								
CourseObjectives: 1. LearnaboutbasicAI fundamentalsandAI problems. 2. Studentswillgain anunderstandingaboutsearching. 3. UnderstandaboutAIknowledge 4. Examinethefundamentalsandterminologiesofexpertsystem. 5. IdentifyandDevelopsimpleapplicationsmakinguseofExpertSystemTools.								
CourseOutcomes:Aftersuccessfulcompletionofthecourse,thestudentwillbeableto:								
CO1	StateapplicationsofArtificialIntelligence							
CO2	EnumerateproblemsolvingstrategiesinAI							
CO3	Illustrateproblemreductiontechniques							
CO4	Applyknowledgerepresentationtechniques tosolverealworldproblems							
CO 5	ApplyComputationalIntelligencetechniquestosolvereal-worldproblems							

CO-POMapping													
CO	**PO**											**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2		1										2
CO2	2	2	2										2	3
CO3	3	3	3	2									3	3
CO4	3	2	3	3	2								3	2
CO5	3	2	3	2	2								2	
1:Low, 2-Medium,3-High														

COURSECONTENT	CO
Task -1	
Install the python software/Anaconda- python and install useful package and install NLTK software.	CO1
Task-2	
a. Write a python program to print the multiplication table for the given number? b. Write a python program to check whether the given number is prime or not? c. Write a python program to find factorial of the given number?	CO2
Task-3	
Write a python program to implement simple Chatbot?	CO2
TASK-4	

a. Write a python program to implement List operations (Nested List, Length, Concatenation, Membership, Iteration, Indexing and Slicing)? b. Write a python program to implement List methods (Add, Append, Extend& Delete).	CO3
TASK-5	
a. Write a python program to Illustrate Different Set Operations? b. Write a python program to generate Calendar for the given month and year?	CO2
TASK-6	
Write a python program to implement Simple Calculator program?	CO2
TASK-7	
a. Write a python program to Add Two Matrices. b. Write a python program to transpose a Matrix.	CO3
TASK-8	
Write a python program to implement Breadth First Search Traversal	CO4
TASK-9	
Write a python program to implement Water Jug Problem	CO4
TASK-10	
a. Write a python program to remove punctuations from the given string? b. Write a python program to sort the sentence in alphabetical order?	CO4 CO5
TASK-11	
Write a program to implement Hangman game using python.	CO5
TASK-12	
Write a program to implement Tic-Tac-Toe game using python.	CO5
Totalhours:	**48hours**

AdditionalExperiments:	
TASK-13	
a. Write a python program to remove stop words for a given passage from a text file Using NLTK? b. Write a python program to implement stemming for a given sentence using NLTK? c. Write a python program to POS (Parts of Speech) tagging for the give sentence using NLTK	CO5
TASK-14	
a. Write a python program to implement Lemmatization using NLTK? b. Write a python program to for Text Classification for the give sentence using NLTK?	CO5

Self-Study:

Contentstopromoteself-Learning:

SNO	Topic	CO	Reference
1	Prolog	CO1	https://www.youtube.com/watch?v=hBz3DgXlg0Q

2	ArtificialIntelligence	CO1	**https://www.youtube.com/watch?v=JMUxmLyrhSk&=527s**
3	ExpertSystems	CO2	**https://www.youtube.com/watch?v=l0CRFuA0m_8&=37s**

TextBook(s):

1. Think Python, How to Think Like a Computer Scientist, Version 2.0.17, Allen Downey, Green Tea Press.
2. Artificial Intelligence a Modern Approach, Stuart Russell, Peter Norvig (Person Education), 2nd edition.
3. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000

ReferenceBook(s):

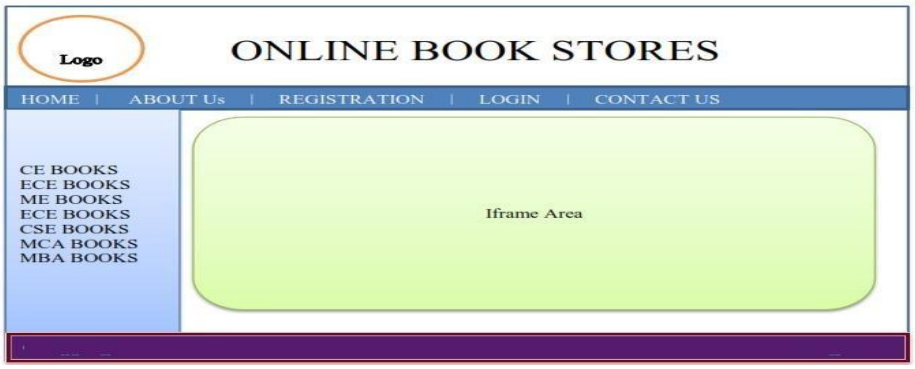
1. Python Essential Reference, David M. Beazley, Pearson Education, Inc.
2. Fluent Python, Luciano Ramalho by O'Reilly Media
3. Python Cookbook, David Beazley and Brian K. Jones, O'Reilly Atlas.3e
4. Artificial Intelligence- Rich E & Knight K (TMH), 4th edition.
5. Artificial Intelligence Structures and Strategies complex problem Solving – George F. Lugar Pearson Education.

Web References:

https://www.youtube.com/watch?v=l0CRFuA0m_8&t=121shttps://www.youtube.com/watch?v=OVZUKXxMzSEhttps://www.youtube.com/watch?v=Hor5r8bz8SA

NARAYANA ENGINEERING COLLEGE:NELLORE								
21MC307	WebTechnologiesLAB							R21
Semester	Hours /Week			Total hrs	Credit	MaxMarks		
	L	T	P		C	CIE	SEE	TOTAL
III	0	0	3	48	1.5	40	60	100
Pre-requisite: JavaProgrammingLanguage								
CourseObjectives: 1. Togainknowledgeoncreatingthestaticweb pages 2. Topreparestudentsforcreatingthedynamicandresponsiveweb pages 3. Topreparestudentsforcreatingtheserver sideweb pagesusingdatabase								
CourseOutcomes:Aftersuccessfulcompletionofthecourse,thestudentwillbeableto:								
CO1	Buildawebpageontheir ownand usingvalidations							
CO2	ApplybasicresponsiveprogramsusingAngularJs							
CO3	Applytheconceptsfor writingtheprogramsusingXML							
CO4	Buildtheserver sideapplicationswithdatabaseconnectivityusingforms							

CO-POMapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	1	2									1	2	2
CO2	1	1	1									2	1	1
CO3	1	1	1									1	2	2
CO4	2	2	2									2	2	2
1-Low, 2-Medium, 3-High														

<table>
<tr><th>COURSECONTENT</th><th>CO</th></tr>
<tr><td>Task1-HTMLandCSS</td><td></td></tr>
<tr><td> 

Createthefollowingweb
1. Welcome.html
Itexplainaboutwebsite
(Hint:Headingthewebsite(PreferableH1,Describewebsite)it includesminimumtwoparagraphs)</td><td>CO1</td></tr>
<tr><td>2. Aboutus.html
(Hint:Aboutowner ofwebsite)
3. Contactus.html
(Hint:Incontactus.htmlweb-pageaddGooglemaps)
4. List.html
(Hint:MentionListofcourses)</td><td></td></tr>
<tr><td>Task-2-HTMLandCSSextension</td><td></td></tr>
<tr><td>2.a.Createwebpagesforeachcourse.Examplecse.html(Hint:ItcontainsHeadingandListofsubjectsintabularform)
Example
<table><tr><th>SNo</th><th>Title Book</th><th>Author</th><th>Publisher</th><th>Price</th><th>Image</th></tr><tr><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td></tr></table>
b. CreateRegistrationandLoginforms
RegistrationForm:ItcontainsStudentName,RollNumber,Password, Gender,EmailID,Phone Number,optedcourse andlanguages known.
LoginForm:Itcontainsrollnumber, name, userid, password, submitbuttonand cancelbutton</td><td>CO1</td></tr>
<tr><td>Task-3-CSS3</td><td></td></tr>
<tr><td>3.a.ApplyCSS 3 onweb-pagescreatedon1and2 experiments.
b. Makeuseoftheselectorslikeclass,id, htmlelements, pseudoclassesandelements</td><td>CO1</td></tr>
</table>

TASK-4–HTML5andCSS3	
4. DesignHTML5webpagebyembeddingAudio, Videoelements. 5. WriteHTML5andCSS3codetodrawArc,Circle,RectangleandTriangleusingCanvas.	CO1
TASK-5-Javascript	
6. Writeajavascriptprogramtocreatecalculator 7. WriteaJavaScriptprogramtofind theareaofatrianglewherelengthsofthethreeofitssides anddisplaytheoutputs inpopupwindows	CO1
TASK-6-JavascriptandXML	
8. ApplyvalidationandpatternmatchingonRegistrationandLoginformson2(b)experiment 9. WriteanXMLfilewhichwilldisplaytheBookinformationwhich includesthefollowing: 1) Title ofthe book 2) AuthorName 3) ISBNnumber 4) Publishername 5) Edition 6) Price WriteaDocumentTypeDefinition(DTD)tovalidatetheaboveXML file.	CO3
TASK-7-XMLExtension	
10. CreateaXMLschematodescribeabankthathasoneormorecustomers,accountsoremploye e 1. Eachcustomerhasacustomerid,nameandaddress 2. Eachaccounthasanaccountid,branchid,customerid,accounttype,balance	CO3
3.Eachemployeehasaempid, name,designation, doj,salaryandaddress 11.CreatetheXML filethatcontainstheinformationaboutfivestudentsanddisplayingthe XMLfileusingXSLT.	
TASK-8-PHP	
12. WritePHP programoncontactuspage 13. Assumefourusersuser1,user2,user3anduser4havingthepasswords pwd1,pwd2,pwd3andpwd4respectively.WriteaPHPfor doingthefollowing 1. CreateaCookieandaddthesefour userid'sandpasswordstothisCookie. 2. Readtheuser id and passwordsenteredintheLoginformandauthenticatewiththevalues(useridandpassw ords)availableinthe cookies. If he is a valid user(i.e., user-name and password match) you should welcome himbyname(user-name)elseyoushoulddisplay"Youarenotanauthenticateduser''.	CO4
TASK-9-PHPExtension	
14. CreateadatabaseandwriteaPHPprogramfor registeringusersofawebsiteandlogin 15. Createatablewhichshouldcontainatleastthefollowingfields:name,password,email-id, phonenumber(theseshouldholdthedatafromtheregistrationform). Write a PHP programto connect to that database and extract data from the tables anddisplaythem. ExperimentwithvariousSQLqueries. Insertthedetailsoftheuserswhoregister withthewebsite,wheneveranewuserclicksthesubmitbuttoninthe registrationpage	CO4
TASK-10PHP	

16.Insertthe detailsofthe 3or4userswhoregisterwiththe websitebyusing registrationform.Authenticatetheuserwhenhesubmitsthe loginformusingtheusername andpassword)fromthedatabase	CO4
Totalhours:	**48hours**

AdditionalExperiments:	
TASK-14	
23. Writeastructs2programtocreatesamplechatapplication 24. Writeaphpprogramtocreatesampleonlinequizapplication	CO4

TEXTBOOKS:

1. KogentLearningsolutionsInc.,"HTML 5Blackbook",Dreamtech,2011,
2. UttamKRoy,"Web Technologies",Oxford,2010
3. ShyamSeshadri&BradGreen,AngularJS:UPandRunning,publishedbyO'ReillyMedia,Inc.,2015

REFERENCEBOOKS:

1. RobertWSebesta,"ProgrammingtheWorldWideWeb",7ed,Pearson,2012
2. PaulSWang,SandaSKatila,"AnIntroductiontoWebDesign,Programming",Cengage,2003.

OnlineResources:

1. https://www.udemy.com/topic/angularjs/
2. https://www.coursera.org/courses?query=angularjs
3. https://www.coursera.org/learn/web-applications-php?
4. https://www.udemy.com/topic/php/

WebReferences:

1. https://www.w3schools.com/
2. https://www.tutorialspoint.com/html/index.htm
3. https://www.javatpoint.com/html-tutorial

NARAYANAENGINEERINGCOLLEGE:NELLORE								
21MC310	BIGDATAANALYTICS							R 21
Semester	Hours /Week			Total hrs	Credit	MaxMarks		
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

Pre-requisite: BasicconceptofBigData

CourseObjectives:

- IntroductiontoBigData&BigDataChallenges.
- Limitations&SolutionsofBigData Architecture.
- Hadoop&itsFeatures.
- HadoopStorage:HDFS(HadoopDistributedFileSystem)
- HadoopProcessing:MapReduceFramework.
- DifferentHadoopDistributions.

CourseOutcomes:Aftersuccessful completionofthecourse,thestudentwillbeableto:

CO1	To explorethefundamentalconceptsofBig Data**.(BL-2)**
CO2	ToLearnBasic concepts ofHadoop. **(BL-2)**
CO3	ToWriteHadoopMapReducePrograms for analyzingBigdata. **(BL-2)**
CO4	ToExploreHadoopEnvironment. **(BL-2)**
CO5	ToLearn fundamentals of HBase and Zookeeper. **(BL-2)**

CO-POMapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		3										2	2
CO2	2	2	3										1	1
CO3	2	1	2	2	2								2	1
CO4	2	2	2	2	1								2	1
CO5	2	2	1	2	2								1	1

1:Low,2-Medium,3-High

COURSECONTENT

MODULE–1	UnderstandingBig Data	10 Hours

Introduction to Big Data Platform – Challenges of Conventional System , features, Datasets,DataAnalysis,DataAnalytics-DescriptiveAnalysis, DiagnosticsAnalytics,Predictive Analytics,PrescriptiveAnalytics,BigDataCharacteristics – volume,velocity,variety,veracity,value,DifferentTypesofData– StructuredData,UnstructuredData,SemiStructured Data.

At the endofthe Module 1,studentswillbe able to:

1. **illustrate**DataAnalytics. **(BL-2)**
2. **Learn**toDiagnosticsAnalyticsandAnalytics. **(BL-2)**
3. **Identify**basicsandBigDataCharacteristics.**(BL-3)**

MODULE-2	HadoopBasics	10 Hours

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop – Analyzing the Data with Hadoop – Scaling Out – Hadoop Streaming – Design of HDFS- Java interfaces to HDFS Basics-Developing a Map Reduce Application – How Map Reduce Works – Anatomy of a Map Reduce Job run – Failures – Job Scheduling – Shuffle and Sort – Task Execution – Map Reduce Types and Formats –

Map Reduce Features.

At theendofthe Module2,studentswillbeableto:

1. **Learn**thehistoryofhadoop. **(BL-2)**
2. **Developing**theanalyzing thedatawithunixtools.**(BL-3)**
3. **Describe**HDFSand MapreduceArchitecture. **(BL-2)**

MODULE-3	**WritingHadoopMapReducePrograms**	**10 Hours**

Understanding the basics of MapReduce, Introducing Hadoop Map Reduce-Listing Hadoop mapReduceentities, Understanding theHadoop MapReducescenario, Understanding the limitationsofMapReduce,WritingaHadoopMapReduceexample-Understanding thestepstorunaMapReducejob.

At theendofthe Module3,studentswillbeableto:

1. **Demonstate** thebasicsofMapReduce. **(BL-2)**
2. **Apply** BasicoperationsonHadoopMapReduce.**(BL-3)**
3. **Describe**thestepstorunaMapReducejob. **(BL-2)**

MODULE-4	**Hadoop Environment**	**9 Hours**

Setting up a Hadoop Cluster – Cluster specification – Cluster Setup and Installation –Hadoop Configuration – Security in Hadoop – Administering Hadoop – HDFS – Monitoring – Maintence – Hadoop Benchmarks – Hadoop in the Cloud.

At theendofthe Module4,studentswillbeableto:

1. **Descrbe**Cluster Setup and Installation. **(BL-2)**
2. **Demonstrate**Security in Hadoop. **(BL-2)**
3. **Describe**Hadoop Benchmarks. . **(BL-2)**

MODULE-5	**Frame works**	**9 Hours**

Applications on Big Data Using Pig and Hive – Data Processing operators in Pig – Hive Services – HiveQL – Querying Data in Hive – fundamentals of HBase and Zookeeper – IBM Info Sphere Big Insights and Streams. Visualization - Visual data analysis techniques, interaction techniques; Systems and applications.

At theendofthe Module5,studentswillbeableto:

1. **Describe**theApplicationsonBigDataUsingPigandHive. . **(BL-2)**
2. **Demonstrate**DataProcessingoperatorsinPig. . **(BL-2)**
3. **Learn**theVisualdataanalysistechniques,interactiontechniques. . **(BL-2)**

Totalhours:	**48hours**

Contentbeyondsyllabus:

1. AdvancedtopicsrelatedissuesinBigDataAnalytics.
2. LearningexperiencemeldstheknowledgeofDataAnalytics withhands-ondemosandprojects.

Self-Study:

Contents topromoteself-Learning:

SNO	Topic	CO	Reference
1	UnderstandingBig DataRequirements	CO1	**https://www.redhat.com/en/topics/big-data**
2	HadoopBasics	CO2	**https://www.tutorialspoint.com/hadoop/index.htm**

3	WritingHadoop MapReducePrograms	CO3	**https://hadoop.apache.org/docs/current/hadoop-mapreduce**
4	Hadoop Environment	CO4	**https://www.tutorialspoint.com/hadoop/hadoop_enviornment_setup.htm**
5	Frame works	CO5	**https://www.tutorialspoint.com/hive/index.htm**

TextBook(s):

1. "BigDataFundamentals:Concepts,Drivers&Techniques",1/e,2016,ThomasErl,WajidKhattak,Paul Buhler,PrenticeHall.
2. "BigDataAnalyticswithRandHadoop",1e,2013,VigneshPrajapati,PacktPublishingLtd,UK.

ReferenceBook(s):

1. MichaelBerthold,DavidJ.Hand,"IntelligentDataAnalysis",Springer,2007.
2. JayLiebowitz,"BigDataandBusinessAnalytics" AuerbachPublications,CRCpress(2013).
3. TomPlunkett, MarkHornick, "UsingRtoUnlocktheValueofBigData:BigData
4. Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media(2013),Oraclepress.

OnlineResources:

1. https://www.analyticsvidhya.com/resources-big-data/

WebReferences:

1. www.jigsawacademy.com
2. www.allindiaexams.in
3. www.upgrad.com
4. www.datamation.com

NARAYANA ENGINEERING COLLEGE:NELLORE								
21MC311	SOFTWARE ARCHITECTURE							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

Course Objectives:

- Understand software architectural requirements.
- To analyze the architecture styles.
- Be exposed to various quality attributes.
- To analyze the achieving architecture goals
- To analyze the architecture of cloud environment.

Course Outcomes: After successful completion of the course, the student will be able to:	
CO 1	Discuss the importance and role of software architecture in large-scale software systems**.(BL-2)**
CO 2	Analyze the architecture styles**(BL-3)**
CO 3	Illustrate the quality attributes of a system at the architectural level**.(BL-2)**
CO 4	Implement the major software architecturee models**.(BL-3)**
CO 5	Analyze the software architecture qualities, attributes and solutions**.(BL-3)**

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	1	1										2
CO2	3	2	2	1									1	2
CO3		2	1		1								1	1
CO4	3	2	2	2									2	1
CO5	3	2	1	1									1	2
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	**ENVISIONING ARCHITECTURE**	**10 H**

Introduction – What is software Architecture-What is Software Architecture, Other Points of View, Architectural Patterns, Reference Models, and Reference Architectures, Importance of Software Architecture, Architectural Structures and views. Architecture Business Cycle- Architectures influences, Software Processes and the Architecture, Business Cycle, Making of "Good" Architecture.

At the end of the Module 1, students will be able to:

5. Understand the software architectural requirements**.(BL-1)**

6. Describe influence of software architecture on business. **.(BL-2)**

MODULE -2	DESIGNING THE ARCHITECTURE WITH STYLES	9 H

Designing the Architecture: Architecture in the Life Cycle, Designing the Architecture, Formatting the Team Structure, Creating a Skeletal System.
Architecture Styles: Architectural Styles, Pipes and Filters, Data Abstraction and Object-OrientedOrganization, Event-Based, Implicit Invocation, Layered Systems, Repositories, Interpreters.

At the end of the Module 2, students will be able to:

1. Ability to understand the architecture life cycle**.(BL-2)**
2. Describe the use of architecture styles **.(BL-2)**

MODULE-3	CREATING AN ARCHITECTURE-1	10 H

Creating Architecture: Understanding Quality Attributes – Functionality and Architecture, Architecture and Quality Attributes, System Quality Attributes, Quality Attribute. Scenarios in Practice, Other System Quality Attributes, Business Qualities, Architecture Qualities. Achieving Qualities: Introducing Tactics, Availability Tactics, Modifiability Tactics, Performance, Tactics, Security Tactics, Testability Tactics, Usability Tactics.

At the end of the Module 3, students will be able to:

1. Ability to understand, to use the quality attributes **.(BL-2)**
2. Explain the tactics of software architecture**.(BL-3)**

MODULE-4	CREATING AN ARCHITECTURE-II	9 H

Documenting Software Architectures: Use of Architectural Documentation, Views, Choosing the Relevant Views, Documenting a view, Documentation across Views. Reconstructing Software Architecture: Introduction, Information Extraction, Database Construction, View Fusion, and Reconstruction.

At the end of the Module 4, students will be able to:

17. Ability to use architecture documentation. **.(BL-2)**
18. Specify the relevant views in software architecture**.(BL-2)**

MODULE-5	ANALYZING ARCHITECTURES	10 H

The ATAM: Participants in the ATAM, Outputs of The ATAM, Phases Of the ATAM. The CBAM: Decision-Making Context, The Basis for the CBAM, Implementing the CBAM. The World Wide Web: A Case study in Interoperability- Relationship to the Architecture Business Cycle, Requirements and Qualities, Architecture Solution, Achieving Quality Goals.

At the end of the Module 5, students will be able to:

14. Ability to analyze the architecture qualities, attributes and solutions. **.(BL-3)**
15. Ability to select the best architecture**.(BL-3)**

	TOTAL HOURS:	48 H

Content beyond syllabus:
Object Oriented Frameworks, Software Product Line Architecture

Self-Study:
Contents to promote self-Learning:

SNO	Topic	CO	Reference	
1	Software Architecture	CO1	https://www.geeksforgeeks.org/fundamentals-of-software-architecture/	
2	Architecture Styles	CO2	https://www.geeksforgeeks.org/software-engineering-architectural-design/	
3	System Quality Attributes	CO3	https://www.softwaretestingmaterial.com/quality-attributes-in-software-architecture/	
4	Database Construction	CO4	https://www.geeksforgeeks.org/data-architecture-design-and-data-management/	
5	ATAM	CO5	https://www.geeksforgeeks.org/architecture-tradeoff-analysis-method-atam/	

Text Book(s):

1. Software Architectures in Practice, Len Bass, Paul Clements, Rick Kazman, 2nd Edition, Pearson Publication.
2. Software Architecture , Mary Shaw and David Garlan, First Edition, PHI Publication, 1996

Reference Book(s):

1. Software Design: From Programming to Architecture, Eric Braude, Wiley, 2004.
2. N. Domains of Concern in Software Architectures and Architecture Description Languages. Medvidovic and D. S. Rosenblum. USENIX.

Online Resources:

1. https://cosmolearning.org/courses/software-architecture-design/video-lectures/

Web Resources:

1. https://www.tutorialspoint.com/software_architecture_design/index.htm
2. https://index-of.es/Varios2/Software%20Architecture%20and%20Design%20Tutorial.pdf

NARAYANA ENGINEERING COLLEGE: NELLORE								
21MC312	DATAWAREHOUSE & DATAMINING							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	2	0	2	64	3	40	60	100

Pre-requisite: Data Base Management Systems

Course Objectives:

- To facilitate with the concept of Data warehouse and Data mining
- To introduce the concept of Datawarehousing with special emphasis on design
- To understand the concepts of Association and Correlation
- To understand the concept of Classification
- To understand the concept of Clustering

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	**Remember** the basics of **Datawarehouse and Data mining**(BL-1)
CO 2	**ApplyData Pre-processing techniques** in detail(BL-3)
CO 3	**Illustrate** the concepts of **Association and Correlation techniques**(BL-2)
CO 4	**Demonstrate** the concepts of **Classification Methods**(BL-2)
CO 5	**Demonstrate** the concepts of **Clustering Methods**(BL-2)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	1										1	
CO2	2	1	2	1	2								2	2
CO3	1		1											1
CO4	2	1			1	1							2	
CO5	1	2	2										1	2

COURSE CONTENT

MODULE – 1	Introduction to Data Mining	7H

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining

At the end of the Module 1, students will be able to:

1. Discuss about Datamining.(BL-2)
2. Demonstrate about the Datawarehouse Basics.(BL-2)
3. Student able to learn about the need of data mining and Datawarehouse.(BL-1)

MODULE -2	Data Preprocessing & OLAP Technology	7 H

Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction.

Data Warehouse and OLAP Technology for Data Mining: Data Warehouse,

Multidimensional Data Model, Data Warehouse Architecture.		
At the end of the Module 1, students will be able to: 1. Demonstrate about the Data Pre-processing(BL-2) 2. Illustrate about the stages of Data Pre-processing.(BL-2) 3. Analyze the stages and OLAP Technology in Data mining & Datawarehouse(BL-3)		
MODULE-3	**Mining Frequent Patterns, Associations and Correlations**	**6H**
Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.		
At the end of the Module 1, students will be able to: 1. Illustrate about the Mining Frequent Patterns.(BL-2) 2. Demonstrate about the Association rules in Data mining (BL-2) 3. Importance of association in Datamining.(BL-2)		
MODULE-4	**Classification Analysis**	**6H**
Classification and Prediction Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Prediction		
At the end of the Module 1, students will be able to: 1. Demonstrate of Classification analysis in Data Mining(BL-2) 2. Illustrate of different Classification Algorithms in Datamining(BL-2) 3. Student able to analyze the classification methods in Datamining.(BL-3)		
MODULE-5	**Cluster Analysis**	**6H**
Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods., Density-Based Methods, Outlier Analysis		
At the end of the Module 1, students will be able to: 1. Demonstrate of Cluster Analysis in Data mining(BL-2) 2. Analyze of various clustering algorithms used in Data mining(BL-2) 3. Implementation of Clustering algorithms in Data mining Problems(BL-2)		
	Total Hours:	**32Hours**

Content beyond syllabus: Quality Assurance , Selenium Testing Tool ,Bugzilla Testing Tool

Self-Study: Contents to promote self-Learning:

SNO	Topic	CO	Reference

	1	KDD Process	CO1	https://www.geeksforgeeks.org/kdd-process-in-data-mining/
	2	Data ware House Architecture	CO2	https://www.javatpoint.com/data-warehouse-architecture
	3	Apriori Algorithm	CO3	https://www.geeksforgeeks.org/apriori-algorithm/
	4	Naïve Bayesian Method	CO4	https://www.geeksforgeeks.org/naive-bayes-classifiers/
	5	Outlier Analysis	CO5	https://www.geeksforgeeks.org/types-of-outliers-in-data-mining/

Text Book(s):

1. Data Mining – Concepts and Techniques - Jiawei Han &MichelineKamber, Morgan Kaufmann Publishers, Elsevier,2nd Edition, 2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

Reference Book(s):

1. Data Mining Techniques – Arun K Pujari, 2nd edition, Universities Press.
2. Data Warehousing in the Real World – Sam Aanhory& Dennis Murray Pearson Edn Asia.
3. Insight into Data Mining, K.P.Soman, S.Diwakar, V.Ajay, PHI, 2008.
4. Data Warehousing Fundamentals – PaulrajPonnaiah Wiley student Edition

Online Resources:

6. https://www.geeksforgeeks.org/data-warehousing/
7. https://www.tutorialspoint.com/dwh/index.htm
8. https://www.javatpoint.com/data-warehouse
9. https://www.guru99.com/data-mining-tutorial.html

DATA WAREHOUSING & DATA MINING LAB

Task - 1	**Listing of categorical attributes and the real-valued attributes separately.**	**CO1**
List all the categorical (or nominal) attributes and the real-valued attributes separately.		
Task - 2	**Rules for identifying attributes**	**CO1**
What attributes do you think might be crucial in making the credit assessment? Come up with some simple rules in plain English using your selected attributes.		
Task - 3	**Training a decision tree**	**CO2**
One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.		
Task - 4	**Test on classification of decision tree.**	**CO2**
Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy?		
Task -5	**Using Cross Validation Training data set**	**CO3**
Create a Decision tree by cross validation training data set using Weka mining tool.		
Task -6	**Testing on the training set**	**CO3**
Is testing on the training set as you did above a good idea? Why? Why not?		
Task - 7	**Find out differences in results using decision tree and cross-validation on a data set.**	**CO4**
One approach for solving the problem encountered in the previous question is using cross-validation? Describe what cross-validation is briefly. Train a Decision Tree again using cross-validation and report your results. Does your accuracy increase/decrease? Why?		
Task -8	**Significance of attributes in decision tree.**	**CO4**
Check to see if the data shows a bias against “foreign workers” (attribute 20), OR “personal status” (attribute 9). One way to do this (perhaps rather simple method) is to remove these attributes from the dataset and see if the decision tree created in those cases is significantly different from the full dataset case which you have already done. To remove an attribute you can use the preprocess tab in weka’s GUI Explorer. Did removing these attributes have any significant effect? Discuss		
Task -9	**Trying generation of decision tree with various number of decision tree.**	**CO4**
Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and 21, the class attribute (naturally)). Try out some combinations. (You had removed two attributes in previous problem Remember to reload the ARFF data file to get all the attributes initially before you start selecting the ones you want.)		
Task -10	**Decision trees.**	**CO5**
Sometimes, the cost of rejecting an applicant who actually has a good credit Case 1. Might be higher than accepting an applicant who has bad credit Case 2. Instead of counting the misclassifications equally in both cases, give a higher cost to the first case (say cost 5) and lower cost to the second case. You can do this by using a cost matrix in WEKA. Train your Decision Tree again and		

report the Decision Tree and cross-validation results. Are they significantly different from results obtained in problem 9 (using equal cost)?	
Total Hours: 32 Hours	
ADDITIONAL TASKS:	
Task - 11 **Convert a Decision Trees into "if-then-else rules".**	
Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees? How does the complexity of a Decision Tree relate to the bias of the model?	
Task - 12 **Reduced error pruning for training Decision Trees using cross-validation**	
You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning - Explain this idea briefly. Try reduced error pruning for training your Decision Trees using cross-validation (you can do this in WEKA) and report the Decision Tree you obtain? Also, report your accuracy using the pruned model. Does your accuracy increase?	

Textbooks:

1. Data Mining – Concepts and Techniques - Jiawei Han &MichelineKamber, Morgan Kaufmann Publishers, Elsevier,2nd Edition, 2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

Reference Book

1. Data Mining Techniques – Arun K Pujari, 2nd edition, Universities Press.
2. Data Warehousing in the Real World – Sam Aanhory& Dennis Murray Pearson Edn Asia.

NARAYANA ENGINEERING COLLEGE:NELLORE							
21MC313	MOBILE APPLICATION DEVELOPMENT						R 21
Semester	Hours / Week			Total hrs	Credit	Max Marks	
	L	T	P		C	CIE	SEE	TOTAL
	3	0	0	48	3	40	60	100

Pre-requisite: Java programming and Object-oriented programming, Basics of any Scripting Language.

Course Objectives:

1. To understand fundamentals of android operating systems.
2. To understand the platform, tools, technology and process for developing mobile applications.
3. To demonstrate the operation of the application, configuration files, intents and activities.
4. To develop and deploy Android applications.
5. To illustrate the various components, layouts and views in creating android applications.

Course Outcomes: After successful completion of the course, student will be able to:

CO 1	Identify a significant programming component, involving the sensors and hardware features of mobile device. (BL-2)
CO 2	Demonstrate the use of Android software development controls. (BL-2)
CO 3	Construct mobile applications on the Android Platform using different layouts for playing video and audio. (BL-3)
CO 4	Acquire the Information Using Dialogs and Fragments by the mobile applications for the Android operating system. (BL-3)
CO 5	Prepare mobile applications involving Menus and Action Bars. (BL-3)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1										1	1
CO2	2	1	2	1									2	2
CO3	2	2	2	2	2								2	1
CO4	1	1	2	2								1	1	2
CO5	2	3	3	1								1	2	1

1: Low, 2-Medium, 3- High

COURSE CONTENT		
MODULE – 1	**Introduction to Android**	**12H**

The Android 4.1 jelly Bean SDK, Understanding the Android Software Stack, installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text view Control, Using the Android Emulator, The Android Debug Bridge(ADB), Launching Android Applications on a Handset.		
At the end of the Module 1, students will be able to: 7. Observe the features of android software. (BL-2) 8. Understand the order of Android software stack. (BL-2) 9. Discover and Launch an android application on a handset. (BL-2)		
MODULE -2	**Basic Widgets**	**10H**
The Role of Android Application Components, Utility of Android API, Overview of the Android Project Files, Understanding Activities, Role of the Android Manifest File, Creating the User Interface, Commonly Used Layouts and Controls, Event Handling, Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit Text Control, Choosing Options with Checkbox, Choosing Mutually Exclusive Items Using Radio Buttons.		
At the end of the Module 2, students will be able to: 7. Differentiate the hierarchy of files and sub files. (BL-2) 8. Understand the importance of Manifest file. (BL-2) 9. Select the widgets and group different controls for event handling. (BL-2)		
MODULE-3	**Building Blocks for Android Application Design**	**9H**
Introduction to Layouts, Linear Layout, Relative Layout, Absolute Layout, Using Image View, Frame Layout, Table Layout, Grid Layout, Adapting to Screen orientation. Utilizing Resources and Media Resources, Creating Values Resources, Using Drawable Resources, Switching States with Toggle Buttons, Creating an Images Switcher Application, Scrolling Through Scroll View, playing Audio, Playing Video		
At the end of the Module 3, students will be able to: 4. Construct an android application using layouts. (BL-3) 5. Operate audio and video on hand set. (BL-3) 6. Apply displaying progress with Scrolling Through Scroll View.(BL-3)		
MODULE-4	**Selection widgets And Fetching Information Using Dialogs and Fragments**	**9H**
Using List View, Using the Spinner control, Using the GridView Control, Creating an Image Gallery Using the ViewPager Control. Dialogs, Selecting the Date and Time in One Application, Fragments, Creating Special Fragments**.**		
At the end of the Module 4, students will be able to: 19. Choose and select which one is the best view of list. (BL-3) 20. Develop customized dialogs. (BL-3) 21. Selecting the Date and Time in an Application.(BL-3)		
MODULE-5	**Building Menus**	**8H**

Creating Interface Menus and Action Bars, Menus and Their Types, Creating Menus Through XML, Creating Menus Through Coding, Applying a Context Menu to a List View, Using the Action Bar, Replacing a Menu with the Action Bar, Creating a Tabbed Action Bar, Creating a Drop-Down List Action Bar.
At the end of the Module 5, students will be able to: 16. Prepare and produce information through menus. (BL-3) 17. Visualize the Action Bar. (BL-3) 18. Manipulate a Menu with the Action Bar. (BL-3)

Total hours:	**48 hours**

Content beyond syllabus: Advanced Android Programming: Gaming engines like Unity, Unreal EngineEtc..

Self-Study: Contents to promote self-Learning:

SNO	Module	Reference
1	Introduction to Android	https://www.youtube.com/watch?v=ZLNO2c7nqjw (Edureka)
2	Basic Widgets	https://www.youtube.com/user/androiddevelopers (android developers)
3	Building Blocks for Android Application Design	https://www.youtube.com/watch?v=PJ3RdfJ4Np8 (Edureka)
4	Selection widgets And Fetching Information Using Dialogs and Fragments	https://codinginflow.com/tutorials/android/custom-dialog-interface
5	Building Menus	https://www.edureka.co/android-development-certification-course

Text Book(s):

1. B.M Harwani, Android Programming, Pearson Education.
2. Lauren Darcey and Shane Conder, "Android Wireless Application Development", 2nd edition, Pearson Education.

Reference Book(s):

1. Professional Android Application Development, Wiley India Private Limited.
2. Dawn Griffiths, David Griffiths, "Head First Android Development: A Brain-Friendly Guide", Second Edition, O'Reilly Media, 2017.
3. James C Sheusi, Android application Development for Java Programmers, Cengage Learning.
4. w.FrankAbleson, RobiSen, Chris King, C.Enrique Ortiz., Android In Action,Dreamtech.

5. RetoMeier,Professional Android 4 applications development, Wiley India.
6. Wei- Meng Lee, Beginning Android 4 applications development, Wiley India.

Online Resources / Web Resources:

1. https://developer.android.com/guide
2. https://nptel.ac.in/courses/106/106/106106147/
3. https://source.android.com/devices
4. https://android-app-development-documentation.readthedocs.io/en/latest/
5. https://www.udemy.com/course/the-complete-android-oreo-developer-course/
6. https://www.classcentral.com/course/java4android-5446
7. https://www.simplilearn.com/android-app-development-fundamentals-article
8. https://www.edureka.co/blog/android-tutorial/
9. https://android-developers.googleblog.com/2019/04/android-studio-34.html
10. https://www.tutorialspoint.com/android/android_advanced_tutorial.pdf

NARAYANA ENGINEERING COLLEGE:NELLORE								
21MC314	SOFTWARE PROJECT MANAGEMENT							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives: 1. To understand the software management and software economics. 2. To understand how to improve the software economics and its principles. 3. To understand the life cycle phases of project development and its artefacts. 4. To understand the process work flow , checkpoints and project organization responsibilities. 5. To understand the process metrics and process instrumentation.								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Analyze the concept of software management economics.(BL-4)							
CO 2	Determine how to improve software economics.(BL-3)							
CO 3	Analyze life cycle phases in project development and artifact sets.(BL-4)							
CO 4	Define the workflow of the process and project organization responsibilities.(BL-1)							
CO 5	Illustrate the project metrics and process instrumentation. (BL-1)							

CO-PO Mapping													
CO	**PO**											**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	1					2					2	1
CO2	2	3	1		1							1	1	2
CO3	3	2	1										1	2
CO4	3	1	2		1				2				2	1
CO5	1	3	2										1	2
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	**CONVENTIONAL SOFTWARE MANAGEMENT AND SOFTWARE ECONOMICS**	**10 H**
Conventional software management: The Waterfall Model, Conventional software Management Performance. **Evolution of Software Economics:** Software Economics, Pragmatic Software Cost Estimation**.**		
At the end of the Module 1, students will be able to: 1. Describe the steps in Water fall Model. (BL-1) 2. Understand the conventional principles in software management performance and software metrics. (BL-2) 3. Determine the software economics and cost estimation. (BL-1)		

MODULE -2	IMPROVING SOFTWARE ECONOMICS	10H

Improving Software Economics: Reducing Software Product Size, Improving software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections.

The Old way and the NEW way: Principles of Conventional Software Engineering, Principles of Modern Software Management, Transitioning to an Iterative Process.

At the end of the Module 2, students will be able to:

1. Explain the steps included in improving software economics. (BL-2)
2. Define the concept of achieving required quality for successful project . (BL-1)
3. Distinguish between the principles of conventional and modern software management(BL-2)

MODULE-3	LIFE CYCLE PHASES AND ARTIFACTS	10 H

Life Cycle Phases: Engineering and Production Stages, Inception. Elaboration, Construction, Transition Phases.

Artifacts of the Process: The Artifact Sets. Management Artifacts, Engineering Artifacts, Programmatic Artifacts. Model Based Software Architectures: A Management Perspective and Technical Perspective.

At the end of the Module 3, students will be able to:

1. Explain the classification of Lifecycle phases.(BL-2)
2. Identify the different Artifact sets in lifecycle phases. (BL-2)
3. Analyze the model based software architectures.(BL-2)

MODULE-4	WORKFLOWS OF THE PROCESS AND ORGANIZATION RESPONSIBILITIES	9 H

Flows of the Process: Software Process Workflows. Inter Trans Workflows. Checkpoints of the Process: Major Mile Stones, Minor Milestones, Periodic Status Assessments. Interactive Process Planning: Work Breakdown Structures, Planning Guidelines, Cost and Schedule Estimating. Interaction Planning Process, Pragmatic Planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, and Evolution of Organizations. Process Automation: Automation Building Blocks, the Project Environment.

At the end of the Module 4, students will be able to:

1. Determine the process workflow in project development and planning guidelines. (BL-3)
2. Explain Project Organization Responsibilities and Activities. . (BL-2)
3. Identify the Building blocks in process Automation. . (BL-2)

MODULE-5	PROJECT CONTROL AND PROCESS INSTRUMENTATION	9 H

Project Control and Process Instrumention: Seven Core Metrics, Management Indicators, Quality Indicators, Life Cycle Expectations Pragmatic Software Metrics, Metrics Automation.

TAILORING THE PROCESS: Process discriminates, Future Software Management: Modern Project Profiles Next generation software economics, modern process transitions.

At the end of the Module 5, students will be able to: 1. Distinguish between Mangement Indicators and Quality Indicators. . (BL-2) 2. Analyze the Pragmatic Software Metrics and process discrimination. . (BL-3) 3. Describe Modern project profiles and software economics next generations. . (BL-2)
Total hours: 48 hours

Self-Study:

Contents to promote self-Learning:

S NO	Topic	CO	Reference
1	Waterfall Model	CO1	https://www.google.com/search?q=waterfall+model+in+spm&rlz=1C1CHBD_enIN855IN855&oq=waterfall+model+in+spm&aqs=chrome..69i57j0l2.13538j0j15&sourceid=chrome&ie=UTF-8
2	Improving Software Economics	CO2	https://www.slideshare.net/deepkumar814/improving-software-economics
3	Life Cycle Phases	CO3	https://www.geeksforgeeks.org/life-cycle-phases-of-project-management/
4	Workflows of the Process and Project Organization Responsibilities	CO4	https://www.geeksforgeeks.org/process-workflows-in-software-project-management/ https://www.geeksforgeeks.org/project-organizations-and-their-responsibilities/
5	Process Control and Instrumentation And Tailoring the process and Future Software project Management	CO5	http://www.pvpsiddhartha.ac.in/dep_it/lecture%20notes/SPM/unit5.pdf http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.203.4476&rep=rep1&type=pdf https://project-management-software.financesonline.com/future-project-management/

Text Book(s):

1. Software Project Management, Walker Royce: Pearson Education, 2005.
2. Software Project Management, Joel Henry, Pearson Education.

Reference Book(s):

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGrawHill Edition.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education.2005.

Online Resources:

1. https://www.tutorialspoint.com/software_engineering/software_project_management.html
2. https://www.slideshare.net/sheetal_singh/software-project-management-by-walker-royce

Web References:

1. https://docs.google.com/presentation/d/1hYtTO5nJ1yTlOXPWPZTTGtCbYqPEM-bB5GVnxYjuoe0/htmlpresent
2. https://www.slideshare.net/sheetal_singh/software-project-management-by-walker-royce
3. http://archive.mu.ac.in/myweb_test/MCA%20study%20material/M.C.A%20(Sem%20-%20IV)%20Paper%20-%20Software%20Project%20Management.pdf
4. https://london.ac.uk/sites/default/files/study-guides/software-engineering-project-management.pdf

NARAYANAENGINEERINGCOLLEGE::NELLORE								
21MC315	MACHINELEARNING							R21
Semester	Hours /Week			Total hrs	Credit	MaxMarks		
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100
Pre-requisite:Basicsofalgorithmdesign, ProbabilityandStatistics								

CourseObjectives:

1. Tounderstandthebasicprinciplesof machinelearning.
2. Tounderstandvariousclassification methods.
3. Tounderstandtheconceptsofdimensionalityreductionandclustering.
4. Tounderstandthefundamentalsofartificialneuralnetworks.
5. TounderstanddifferentkernelfunctionsandReinforcementlearning.

CourseOutcomes:Aftersuccessfulcompletionofthecourse,thestudentwillbeableto:

CO1	Understandthetypes ofmachinelearningand itsapplications.**(BL-2)**
CO2	Analyzevariousclassificationmethodstoclassifythetraineddata.**(BL–4)**
CO3	Applyprinciplesof clusteringtoclassifyuntrained data.**(BL-3)**
CO4	Understand therole ofneuralnetworksinclassificationofdata.**(BL-2)**
CO 5	Identifytheusageofkernelfunctionsandvariouslearningtechniques.**(BL-1)**

CO-POMapping

CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2											2	2
CO2	1	2	2	1									1	
CO3	3	1	1	2									1	2
CO4	2	2	2	1	1								2	
CO5	3	2	1										1	

1:Low, 2-Medium,3-High

COURSECONTENT

MODULE – 1	INTRODUCTION	10 HOURS

Introduction: MachineLearning,TypesofMachineLearning,Examples.
SupervisedLearning: Learningclassfromexamples,VCDimension,PACLearning,Noise,LearningMultiple Classes, regression, Model Selection and generalization, dimensions of a supervised learningalgorithm.

AttheendoftheModule1,studentswill beableto:

1. Typesofmachinelearning.**(BL - 2)**
2. Examplesofmachinelearninginrealtime.**(BL - 2)**
3. Fundamentalsofclassification.**(BL - 4)**

MODULE -2	CLASSIFICATION	10 HOURS

ParametricMethods: Introduction,MaximumLikelihoodEstimation,EvaluatingEstimator,Bayes'Estimator ,ParametricClassification.
MultivariateMethods: MultivariateData,ParameterEstimation,EstimationofMissingValues,MultivariateClassification,MultivariateRegression.

AttheendoftheModule2,studentswillbeableto:

1. Variousparametricmethodsforclassification. .**(BL - 4)**
2. Estimatorsforevaluation.**(BL - 5)**
3. Multivariateclassification.**(BL - 4)**

MODULE-3	Clustering	10 HOURS

Introduction: Subset Selection,PrincipalComponent Analysis,FactorAnalysis,LinearDiscriminantAnalysis.
Clustering: Introduction,K-meansclustering,HierarchicalClustering,Choosingthenumberofclusters.
Non-parametricMethods:Introduction,non-parametricdensityestimation,non-parametricclassification.

AttheendoftheModule3,studentswillbeableto:

1. Principlesofdimensionalityreductioninnormalizingthedatasize. .**(BL - 2)**
2. Variousclusteringapproachesforgroupinguntraineddata.**(BL - 4)**
3. various non-parametricmethodsusedinclusteringofdata. .**(BL - 4)**

MODULE-4	Decision Trees & ANN	9 HOURS

Decision Tree: Introduction,UnivariateTrees,Pruning,RuleExtractionfromTrees,LearningRulesfromData
MultilayerPerceptron: Introduction,trainingaperceptron,LearningBooleanFunctions,MultilayerPerceptron,BackpropogationAlgorithm.

At theendofthe Module4,studentswillbe ableto:

1. knowingtheprinciplesofhowtoidentifyclasslabels.**(BL - 2)**
2. fundamentalsofartificialneuralnetworks.**(BL - 4)**
3. Understand the Back propagation procedues.**(BL - 4)**

MODULE-5	KERNEL MACHINES &REINFORCEMENT LEARNING	9 HOURS

Kernel Machines: Introduction,SVM, Kerneltricks,verticalkernel,definingkernel,multiclasskernel machines,one-classkernel machines.
ReinforcementLearning: Introduction,singlestate cases,elements of reinforcementlearning,temporaldifferencelearning,generalization,partiallyobservedstate.

AttheendoftheModule5,studentswillbeableto:

1. varioustypesofkernelfunctionsandtheir role.**(BL - 4)**
2. Theroleofreinforcementlearningintrainingthedata.**(BL - 2)**
3. Differentiatebetweenlearningstrategies.**(BL - 4)**

Totalhours:	48hours

Term work:

1. Machine Learning: When you are about to tag someone on Facebook, before even mentioning the name of the person in the image, Facebook gives you a suggestion and 99.99% it gives the right name. How does Facebook know the name of the person you are about to tag in the image?

2. Multivariate Regression : A researcher has collected data on three psychological variables, four academic variables (standardized test scores), and the type of educational program the student is in for 600 high school students. She is interested in how the set of psychological variables is related to the academic variables and the type of program the student is in.

3. Multidimensional Scaling: Vendor Evaluations: Industrial purchasing agents must choose among vendors who differ – for example, in price, delivery, reliability, technical service and credit. How purchasing agents summarize the various characteristics to determine a specific vendor from whom to purchase would be information that would help vendors design sales strategies.

4. Training Procedures: Employee training is one of the most critical parts of the employee experience. When a new employee starts, they're a sponge, ready to absorb information about your company, your policies and procedures, and their role and responsibilities. Existing employees also need ongoing training to learn new skills, improve existing ones and continue to grow over time. But what's the best way to facilitate the training process?

5. Reinforcement Learning :Turns out a walk in the park is not so simple after all. In fact, itis a complex process done by controlling multiple muscles and coordinating who knows how many motions. If carbon-based lifeforms have been developing these aspectsof walking for millions of years, can AI recreate it?

Content beyond syllabus:
1. Inaccessible data and data security

Self-Study:
Contents to promote self-Learning:

SNO	Topic	Reference
1	Introduction toMachineLearning	https://www.edureka.co/blog/introduction-to-machine-learning/, https://www.geeksforgeeks.org/ml-types-learning-supervised-learning/
2	Methods forclassification	https://medium.com/@jorgesleonel/classification-methods-in-machine-learning-58ce63173db8,https://machinelearningmastery.com/types-of-classification-in-machine-learning/

3	ClusteringTechniques	https://www.geeksforgeeks.org/clustering-in-machine-learning/https://www.analyticsvidhya.com/blog/2016/11/an-introduction-to-clustering-and-different-methods-of-clustering/
4	Artificial NeuralNetworks	https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_neural_networks.htm https://www.geeksforgeeks.org/introduction-artificial-neural-network-set-2/
5	ReinforcementLearning	https://www.geeksforgeeks.org/what-is-reinforcement-learning/ https://medium.com/@violante.andre/simple-reinforcement-learning-temporal-difference-learning-e883ea0d65b0

TextBook(s):

1. A Concise Introduction to Machine Learning, Anitha C. Faul, CRC Press, 2020
2. An Introduction to Machine Learning Springer International Publishing Gopinath Rebala, Ajay Ravi, Sanjay Churiwala, 2019.
3. A Brief Introduction to Machine Learning for Engineers Now Publishers Osvaldo Simeone,2018
4. E. Alpaydin “Introduction to Machine Learning”, third Edition, MIT Press, 2014

ReferenceBook(s):

1. AnIntroductiontoMachineLearning SpringerInternationalPublishing MiroslavKubat(auth.),2017
2. AnintroductiontomachinelearningInterpretability,O’Reilly,PatrickHallandNavadeepGill,2018
3. AbriefintroductiontomachinelearningforengineersKingscollegeLondon,OsvaldoSimeone,2018
2. Anintroductiontomachinelearning,Springer,Kubat,Miroslav,2015

OnlineResources:

1. http://web4.cs.ucl.ac.uk/staff/D.Barber/textbook/091117.pdf
2. https://www.cs.huji.ac.il/~shais/UnderstandingMachineLearning/index.html
3. https://alex.smola.org/drafts/thebook.pdf
4. https://seat.massey.ac.nz/personal/s.r.marsland/MLBook.html

WebReferences:

1. https://www.guru99.com/machine-learning-tutorial.html
2. https://www.toptal.com/machine-learning/machine-learning-theory-an-introductory-primer
3. https://nptel.ac.in/courses/106/106/106106198/
4. https://www.youtube.com/watch?v=T3PsRW6wZSY

SEMESTER- IV

Subject Code	Course Title		
-	**Professional Elective – IV**	**21MC403**	**Cloud Computing**
		21MC404	**Software Quality Assurance**
		21MC405	**Deep Learning**
-	**Professional Elective - V**	**21MC406**	**R-Programming**
		21MC407	**Software Testing**
		21MC408	**Cyber Security**
21MC401	Project		
21MC402	Comprehensive Viva Voce		

NARAYANAENGINEERINGCOLLEGE:NELLORE								
21MC403	CLOUDCOMPUTING							R 21
Semester	Hours/Week			Total hrs	Credit	MaxMarks		
	L	T	P		C	CIE	SEE	TOTAL
IV	3	0	0	48	3	40	60	100

Pre-requisite:Nil

CourseObjectives:

- Thestudentwill learnabout thecloudenvironment.
- Applies the various cloud service models including Iaas, Paas, Saas,
- To understand the techniques of Cloud Programming and Software Environments.
- Tostudytheconcepts of CloudResourceManagementandScheduling.
- Tounderstandthe basicconceptsofStorageSystems.

CourseOutcomes:Aftersuccessfulcompletionofthe course,thestudentwillbeableto:

CO1	**Remember**the**keydimensions**ofthechallengeofCloudComputing**(BL-2)**
CO2	**Apply**oftheeconomics,financial,andtechnologicalimplicationsfor**selectingcloudcomputingforownorganization(BL-2)**
CO3	**Illustrate**thefinancial,technological,andorganizational capacityofemployer's foractively**initiatingandinstallingcloud-basedapplications.(BL-2)**
CO4	**Demonstrate**ofownorganizations'needsforcapacity**buildingandtraininginCloudcomputing-relatedAreas(BL-3)**
CO5	**Assessment**ofCloud resourcesmanagementandschedulingofthecloudresources and **Storage systems in Cloud(BL-2)**

CO-POMapping

CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2										1	
CO2	1	2	1											1
CO3	1		2	1										2
CO4	1	2		3									1	
CO5		1	2											2

1:Low,2-Medium,3-High

COURSECONTENT		
MODULE– 1	**Fundamental Cloud Computing**	**9 H**

Fundamental Cloud Computing-Understanding Cloud Computing, Origins influences, Basic Concepts and Terminology,
Goals,Benefits,risks,Challenges,Rollsandboundaries,Cloudcharacteristics,CloudDeliverymodels,Clouddeploymentmodels.

Attheend oftheModule1,studentswillbeableto:

1. Analyze the components of cloud computing and its business perspective**.(BL-2)**
2. Evaluate the various cloud development tools. **.(BL-2)**
3. Utilizetheresourcemanagementinthecloud. **.(BL-2)**

MODULE-2	Systemsmodeling,Clustering andvirtualization:	10H

Systemsmodeling,Clustering andvirtualization: ScalableComputingovertheInternet,TechnologiesforNetworkbasedsystems,SystemmodelsforDistributedandCloudComputing,Softwareenvironmentsfordistributedsystemsand Clouds, Performance, SecurityAndEnergyEfficiency.

AttheendoftheModule2,studentswillbeableto:

1. Discuss the use of Internet and Network systems. **.(BL-2)**
2. Identify the use of System models for Distributed and Cloud Computing. **.(BL-1)**
3. UnderstandtheuseofClouddatainreal-timeworld. **.(BL-2)**

MODULE-3	Virtual Machines and Virtualization	9H

Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, VirtualizationStructures/Toolsandmechanisms,VirtualizationofCPU,MemoryandI/ODevices,VirtualClustersandResourceManagement,VirtualizationforDataCenterAutomation.**(10Hrs)**

AttheendoftheModule3,studentswillbeableto:

1. Implement the Levels of Virtualization in cloud. **.(BL-3)**
2. Understand the use of Virtualization Structures/ Tools and mechanisms**.(BL-3)**
3. Virtualize the CPU, Memory and I/O Deviceusingdatacentres. **.(BL-2)**

MODULE-4	Cloud Platform Architecture	10 H

Cloud Platform Architecture: Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds,Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service OrientedArchitecture,MessageOrientedMiddleware.

AttheendoftheModule4,studentswillbeableto:

1. Understand the Cloud service models. **.(BL-2)**
2. Analyze the Cloud Resource, Cloud Security and Trust Management. **.(BL-3)**
3. UnderstandtheuseofServiceOriented ArchitectureinCloud. **.(BL-2)**

MODULE-5	CloudProgrammingandSoftwareEnvironments	10H

CloudProgrammingandSoftwareEnvironments: Features ofCloudandGrid Platforms,Programming SupportofGoogleAppEngine,AmazonAWSandMicrosoftAzure.
StorageSystems: Evolutionofstoragetechnology,storagemodels,filesystemsanddatabase,distributedfilesystems,general parallelfilesystems.Googlefilesystem

AttheendoftheModule5,studentswillbeableto:

1. Understand the cloud programming and software environment. **.(BL-2)**
2. Analyze the different cloud platforms used for data storage. **.(BL-3)**
3. Identify the EmergingCloudSoftwareEnvironments. **.(BL-1)**

TotalHours:	**48H**

Contentbeyondsyllabus:

1. CloudDatasecurityusingcryptographictechniques.

Self-Study: Contentstopromoteself-Learning:

SNO	Topic	CO	Reference
1.	Systemmodelsfor Distributed and CloudComputing	CO1	https://www.youtube.com/watch?v=VNRmsACNSaY
2.	Virtualization of CPU,Memoryand I/ODevices	CO2	https://www.youtube.com/watch?v=1CsC5aa0Zek
3.	Cloud Computing andserviceModels	CO3	https://www.youtube.com/watch?v=d7EI8B7jTrI
4.	Programming onAmazon AWS andMicrosoft Azure	CO4	https://www.youtube.com/watch?v=KWxTx7JlWLo
5.	Scheduling AlgorithmsforComputing Clouds	CO5	https://www.youtube.com/watch?v=WEqY5kRk-g0

TextBook(s):

1. Distributedand CloudComputing,KaiHwang,GeoffryC.Fox,JackJ.DongarraMKElsevier.
2. CloudComputing,TheoryandPractice, DanCMarinescu, MKElsevier.

ReferenceBook(s):

1. CloudComputing,APracticalApproach,AnthonyTVelte,TobyJVelte,RobertElsenpeter,TMH.
2. MasteringCloudComputing,FoundationsandApplicationProgramming,RajKumarBuyya,Christenvecctiola,STammaraiselvi,TMH.
3. CLOUDCOMPUTINGPrinciplesandParadigms,RajkumarBuyya,JamesBroberg,AndrzejGoscinski

Online/Web Resources:

1. https://www.tutorialspoint.com/cloud_computing/index.htm
2. https://www.tutorialspoint.com/cloud_computing/index.htm
3. https://www.tutorialspoint.com/cloud_computing/index.htm
4. https://www.tutorialspoint.com/cloud_computing/index.htm
5. https://www.tutorialspoint.com/cloud_computing/index.htm
6. https://www.tutorialspoint.com/cloud_computing/index.htm
7. https://www.tutorialspoint.com/cloud_computing/index.htm

NARAYANA ENGINEERING COLLEGE::NELLORE								
21MC404	SOFTWARE QUALITY ASSURANCE							R2021
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

Pre-requisite: A Course on "Software Engineering".

Course Objectives:

- To understand the basic principles of software quality and quality factors.
- To be exposed to the Software Quality Assurance (SQA) architecture and the details of SQA components.
- To understand how the SQA components can be integrated into the project life cycle.
- To be familiar with the software quality infrastructure.
- To be exposed to the management components of software quality.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	Demonstrate knowledge on quality, architecture, metrics of software development**.[BL:2]**
CO 2	Demonstrate software quality plan for a software project to include sections on change management, configuration management, defect elimination, validation and verification and measurement. **[BL:2]**
CO 3	Design software quality plans for a software project and asses their capability to adopt quality standards. **[BL:3]**
CO 4	Summarize the quality of software product using software quality metrics. And adapt procedures and work instructions, Templates, checklists development for Software quality infrastructure**[BL:2]**
CO 5	Commit to ethics to apply ISO and IEEE standards in preparing the quality plan and documents. **[BL:2]**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1		3	2	3								2	
CO2	2	2	3	2	3								1	
CO3	2	1	2	2	2								2	2
CO4	2	2	2	2	1								2	
CO5	2	2	2	1	1			3					1	

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	Introduction to Quality	10 HOURS

Historical Perspective of Quality, What is Quality? Definitions of Quality, Core Components of Quality, Quality View, Financial Aspect of Quality, Customers, Suppliers and Processes, Total Quality Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools.

At the end of the Module 1, students will be able to:

1. Define Quality. [BL:1]
2. Extend core components of quality. [BL:2]
3. Discuss problem solving software tools. [BL:2]

MODULE -2	Introduction to Software Quality & Architecture	10 HOURS

Need for Software quality – Quality challenges – Software quality assurance (SQA) – Definition and objectives – Software quality factors- McCall‟s quality model – SQA system and architecture – Software Project life cycle Components – Pre project quality components – Development and quality plans.

At the end of the Module 2, students will be able to:

1. Classify need for software quality. [BL:2]
2. Extend McCall‟s quality model. [BL:2]
3. Interpret Software Project life cycle Components. [BL:2]

MODULE-3	SQA Components and Project Life Cycle	10 HOURS

Software Development methodologies – Quality assurance activities in the development process- Verification & Validation – Reviews – Software Testing – Software Testing implementations – Quality of software maintenance – Pre-Maintenance of software quality components – Quality assurance tools – CASE tools for software quality – Software maintenance quality – Project Management.

At the end of the Module 3, students will be able to:

22. Define verification and validation. [BL:1]
23. Illustrate quality assurance tools. [BL:2]

MODULE-4	Software Quality Infrastructure	9 HOURS

Procedures and work instructions – Templates – Checklists – 3S developmenting – Staff training and certification Corrective and preventive actions – Configuration management – Software change control – Configuration management audit -Documentation control – Storage and retrieval.

Software Quality Management & Metrics

Project process control - Software quality metrics – Objectives of quality measurement – Process metrics – Product metrics – Cost of software quality – Classical quality cost model – Extended model – Application of Cost model.

At the end of the Module 4, students will be able to:

19. Classify procedures and work instructions. [BL:2]
20. Extend configuration management audit. [BL:2]
21. Illustrate software quality metrics. [BL:2]

MODULE-5	Standards, Certifications & Assessments	9 HOURS

Quality management standards – ISO 9001 and ISO 9000-3 – capability Maturity Models – CMM and CMMI assessment methodologies - Bootstrap methodology – SPICE Project – SQA project process standards – IEEE st 1012 & 1028 – Organization of Quality Assurance – Department management responsibilities – Project management responsibilities

At the end of the Module 6, students will be able to:

5. Demonstrate quality management standards. [BL:2]
6. Explain project management responsibilities. [BL:2]

Total hours:	48 HOURS

Content beyond syllabus:

1. Application Life-Cycle Management - Secure Application Development.

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	SQA Components	CO1	https://www.tutorialspoint.com/software_quality_mana ent/software_quality_management_sqa_components.htr ~:text=Advertisements,defined%20or%20standardized% quality%20specifications.
2	Software quality challenges	CO2	https://www.slideshare.net/HelmySatria/lecture-1-31203638
3	Software development methodologies	CO3	https://youtu.be/aX4_s5_Hroc
4	Storage and retrieval and Management aspects of Quality	CO4	https://www.researchgate.net/publication/3837365_Stor _and_retrieval_of_software_components_using_aspects https://nptel.ac.in/courses/110/104/110104080/
5	Quality management standards	CO5	https://www.tutorialspoint.com/software_testing_dictionar uality_management.htm

Text Book(s):

1. "Software Quality Assurance",Daniel Galin, Pearson Publication, 2009.

Reference Book(s):

1. Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 1997.
2. Mordechai Ben-Menachem "Software Quality: Producing Practical Consistent Software", International Thompson Computer Press, 1997.
3. Software Quality Assurance – Principles & Practices, 2016, Nina S & Godbole, Alpha Science International Ltd.

Online Resources:

1. www.inf.ed.ac.uk/teaching/.../notes/LectureNote20_SoftwareQuality.pdf
2. www.cs.toronto.edu/~yijun/csc408h/handouts/lecture5.pdf
3. web.uettaxila.edu.pk/CMS/SP2012/.../notes%5CSQA%20Lec_2.pdf
4. www.facweb.iitkgp.ernet.in/~spp/lect14.ppt
5. www.etsmtl.ca/Professeurs/.../Teaching-Software-Quality-Assurance.pdf

NARAYANA ENGINEERING COLLEGE:NELLORE								
21MC406	R PROGRAMMING							R 21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	3	0	0	48	3	40	60	100

Pre-requisite: Basic knowledge of programming.

Course Objectives:

1. Understand the fundamentals of 'R' programming.
2. Learn how to carry out a range of commonly used statistical methods including analysis of variance and linear regression.
3. Explore data-sets to create testable hypotheses and identify appropriate statistical tests.
4. Learn different Packages in R
5. Produce data visualizations with the ggplot package.

Course Outcomes: After successful completion of the course, the student will be able to:

CO1	Be able to use and program in the programming language R.(BL-3)
CO2	Be able to use R to solve statistical problems. (BL-2)
CO3	Be able to implement and describe Monte Carlo the technology. (BL-3)
CO4	Develop and use different packages.(BL-3)
CO5	Be able to minimize and maximize functions using R. (BL-3)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1		1									1	
CO2	2	2	3		2								1	1
CO3	3	1	2	2	1								3	1
CO4	1	1	2	1									2	3
CO5	3	1												2

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	INTRODUCTION TO R	10H

Getting the Hand of R, Running the R Program, Finding Your Way with R, Command Packages. BECOMING FAMILIAR WITH R: Reading and Getting Data into R, Viewing Named Objects, Types of Data Items, The Structure of Data Items, Examining Data Structure Working with History Commands, Saving your Work in R. WORKING WITH OBJECTS: Manipulating, Viewing, Constructing Data Objects, Forms of Data Objects: Testing and onverting.

At the end of the Module 1, students will be able to:

4. Describe the Purpose of R Programming.(BL-2)
5. Explain the importance of R Packages. (BL-2)

6. Identify various Objects and packages of R. (BL-2)		
MODULE -2	**DATA DISTRIBUTION**	**9H**
Data: Descriptive statistics and tabulation. DISTRIBUTION: Looking at the Distribution of Data SIMPLE HYPOTHESIS TESTING: Using the Student's t-test, The Wilcoxon U-Test (Mann-Whitney), Paired t- and U-Tests, Correlation and Covariance, Tests for Association.		
At the end of the Module 2, students will be able to: 4. Understand Hypothesis Testing.**(BL-2)** 5. DemonstrateDistributions.**(BL-2)** 6. Explain the Correlation and Covariance.**(BL-2)**		
MODULE-3	**INTRODUCTION TO GRAPHICAL ANALYSIS**	**10H**
Box-whisker Plots, Scatter Plots, Pairs Plots(Multiple Correlation Plots) Line Charts, Pie Charts, Cleveland Dot Charts, Bar Charts, Copy Graphics to Other Applications. FORMULA NOTATION AND COMPLEX STATISTICS: Examples of Using Formula Syntax for Basic tests, Formula Notation in Graphics, Analysis of Variance (ANOVA).		
At the end of the Module 3, students will be able to: 5. Understand the different Plots.**(BL-2)** 6. Discuss the Complex Statistics.**(BL-2)** 7. Describe Anova concepts. **(BL-3)**		
MODULE-4	**MANIPULATING DATA AND EXTRACTING COMPONENTS**	**9H**
Creating Data for Complex Analysis, Summarizing Data. REGRESSION (LINEAR MODELING): Simple Linear Regression, Multiple Regression, Curvilinear Regression, Plotting Linear Models and Curve Fitting, Summarizing Regression Models.		
At the end of the Module 4, students will be able to: 22. Explain the concept ofRegression.**(BL-2)** 23. Discuss Linear models.**(BL-3)** 24. Understand the concept of Curve fitting.**(BL-2)**		
MODULE-5	**PLOTS**	**10H**
Adding elements to existing plots, Matrix plots, multiple plots in one window, exporting graphs WRITING YOUR OWN SCRIPTS: BEGINNING TO PROGRAM: Copy and Paste Scripts, Creating Simple Functions, Making Source Code.		
At the end of the Module 5, students will be able to: 1. Understand Plots.**(BL-3)** 2. Understand the concept of Scripts.**(BL-2)**		
	Total hours:	**48 hours**

Term work:

1. Mini Project on Library Management.
2. Write a case study on RStudio Integrated Development Environment (IDE)

3. Write a case study on R Studio.
4. Write a case study on R-Packages.
5. Write a case study on Data Visualization Techniques.
6. Write a case study on R Data Structures.
7. Write case study Data importation methods.
8. Write a Case study on Basic R Data Types.

Content beyond syllabus:

1. Machine Learning Algorithms SVM and XGB explanation.
2. Data Preprocessing Using R.

Text Book(s):

1. R Programming for Data Science by Roger D. Peng.
2. The Art of R Programming by Prashanth singh, Vivek Mourya, Cengage Learning India.

Reference Book(s):

1. Hands-On Programming with R Paperback by Grolemund (Author), Garrett (Author), SPD,2014.
2. The R Book, Michael J. Crawley, WILEY, 2012.

Online Resources:

1. https://www.youtube.com/watch?v=7076ZuAwUn8&list=PLWPirh4EWFpEvN4ktS8LE0cvLCSfhD55t&index=1
2. https://www.youtube.com/watch?v=rGfuLF0QJ2M&list=PLWPirh4EWFpEvN4ktS8LE0cvLCSfhD55t&index=2
3. https://www.youtube.com/watch?v=Al-pTT-YMEA&list=PLWPirh4EWFpEvN4ktS8LE0cvLCSfhD55t&index=3
4. https://www.youtube.com/watch?v=Njw0FHe0jow&list=PLWPirh4EWFpEvN4ktS8LE0cvLCSfhD55t&index=4.

Web References:

1. https://www.youtube.com/watch?v=i8naytvS5G8&list=PLWPirh4EWFpEvN4ktS8LE0cvLCSfhD55t&index=5
2. https://www.youtube.com/watch?v=gKWIM5MN6Go&list=PLWPirh4EWFpEvN4ktS8LE0cvLCSfhD55t&index=6

NARAYANA ENGINEERING COLLEGE: NELLORE								
21MC407	SOFTWARE TESTING							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	3	0	0	48	3	40	60	100

Pre-requisite: Software Engineering

Course Objectives:

- Fundamentals for various testing methodologies.
- Describe the principles and procedures for designing test cases.
- Provide supports to debugging methods.
- Acts as the reference for software testing techniques and strategies.
- Understand of Logic Design

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	**Demonstrate**the **basic testing procedures. (BL-2)**
CO 2	Student able to **write** and generate**test cases and test suites**. **(BL-2)**
CO 3	**Illustrate** the applications manually by applying different **testing methods and automation tools.(BL-2)**
CO 4	**Apply** tools to resolve the **problems in Real time environment.(BL-3)**
CO 5	**Demonstrate** the basic **testing State graphs and Charts**. **(BL-2)**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	1										1	
CO2	2	1	2	1	2								2	2
CO3	1		1											1
CO4	2	1			1								2	
CO5	1	2	2										1	2

COURSE CONTENT

MODULE – 1	Flow graphs and Path testing	10H

Introduction: Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs,Taxonomy of Bugs.Basics Concepts of Path Testing, Predicates, Path Predicates andAchievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.

At the end of the Module 1, students will be able to:

4. Discuss model for testing.(BL-2)
5. Explain the different types of bugs.(BL-2)
6. Discuss about path predicates &path sensitizes methods.(BL-2)

MODULE -2	Transaction Flow Testing & Dataflow Testing	10H

Transaction Flow Testing: Transaction Flow Testing Introduction,Transaction Flows, Transaction Flow Testing Techniques.

Dataflow Testing: Basics of Dataflow Testing, Strategies in Dataflow Testing, Application ofDataflow Testing.		
At the end of the Module 1, students will be able to: 4. Understand transaction flow testing(BL-2) 5. Explain different testing techniques.(BL-2) 6. Define data flow testing strategies.(BL-2)		
MODULE-3	**Domain Testing**	**9H**
Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain testing, Domains andInterfaces Testing, Domain and Interface Testing, Domains and Testability.		
At the end of the Module 1, students will be able to: 4. Explain domain testing.(BL-2) 5. Understand domain and interface testing (BL-2) 6. Identify bugs are nice/ugly domain bugs.(BL-2)		
MODULE-4	**Paths, Path products and Regular expressions**	**10H**
Paths, Path products and Regular expressions: Path Products & Path Expression, ReductionProcedure, Applications, Regular Expressions & Flow Anomaly Detection. **Logic Based Testing:** Overview of logic based testing, Decision Tables, Path Expressions, KV Charts, Specifications.		
At the end of the Module 1, students will be able to: 4. Understand about path, path expressions(BL-2) 5. Explain about reduction procedure.(BL-2) 6. Explain different types of applications in reduction procedure.(BL-2)		
MODULE-5	**State Graphs and Transition Testing**	**9H**
State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, StateTesting, Testability Tips. Motivational Overview, Matrix of Graph, Relations, Power of aMatrix, Node Reduction Algorithm, Building Tools.		
At the end of the Module 1, students will be able to: 4. Explain KV Charts.(BL-2) 5. Explain state graphs.(BL-2) 6. Discuss about decision tables.(BL-2)		
	Total Hours:	**48Hours**

Content beyond syllabus: Quality Assurance , Selenium Testing Tool ,Bugzilla Testing Tool

Self-Study: Contents to promote self-Learning:

S. NO	Topic	CO	Reference
1	**Flow graphs and Path testing**	CO1	https://www.youtube.com/watch?v=t-C3Bt7f1M8

	2	**Transaction Flow Testing & Dataflow Testing**	CO2	https://www.youtube.com/watch?v=581VLmAb3GE
	3	**Domain Testing**	CO3	https://www.youtube.com/watch?v=TEzF7pk0rIY
	4	**Paths, Path products and Regular expressions**	CO4	https://www.youtube.com/watch?v=H_zkA0korRA
	5	**Logic Based Testing**	CO5	https://www.youtube.com/watch?v=hWbwpTNyftk

Text Book(s):

1. Software testing techniques – Boris Beizer, Dreamtech, second edition
2. Software Testing- Yogesh Singh, Camebridge

Reference Book(s):

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing, 3rd edition, P.C. Jorgensen, Aurbach Publications (Dist.by SPD).
3. Software Testing, N.Chauhan, Oxford University Press.
4. Introduction to Software Testing, P.Ammann&J.Offutt, Cambridge Univ. Press.

Online Resources:

10. http://www.softwaretestinghelp.com/practical-software-testing-new-free-ebook-download/
11. http://www.guru99.com/software-testing.html
12. http://www.fromdev.com/2012/04/8-best-software-testing-books-every-qa.html
13. https://onlinecourses.nptel.ac.in/noc16_cs16/preview

Web Resources:

1. http://www.qatutorial.com/?q=Software_Test_Metrics
2. http://softwaretestingfundamentals.com/MODULE-testing/
3. http://qainsights.com/challenges-in-test-automation/
4. http://www.softwaretestinghelp.com/manual-and-automation-testing-challenges/

NARAYANAENGINEERINGCOLLEGE:NELLORE								
21MC408	CYBER SECURITY							R 21
Semester	Hours/Week			Totalhrs	Credit	MaxMarks		
	L	T	P		C	CIE	SEE	TOTAL
IV	3	0	0	48	3	40	60	100

Pre-requisite:ComputerNetworks

CourseObjectives:

- Appraisethecurrentstructure ofcybersecurityrolesacrosstheDoD(Department ofDefense) enterprise, including the roles and responsibilities of the relevantorganizations.
- Evaluatethetrendsandpatternsthatwilldeterminethefuturestateofcybersecurity.
- Tocreateanassuranceframeworkfordesignofsecuritypolicies.
- Tostrengthentheregulatoryframeworkforensuringasecurecyberspaceecosystem
- UnderstandofCyberLawsandhowtoimplementinthebusinessrequirements

CourseOutcomes:Aftersuccessfulcompletionofthecourse,the studentwillbeableto:

CO1	**Illustrate**theCybersecurityand**troubleshootingofCyberSecurity(BL-4)**
CO2	**Design**ofnewsecurityapproachesand**SecurityToolsinCyberCrimes(BL-6)**
CO3	**ApplyingComputerForensics** andpracticestotheenvironment**(BL-4)**
CO4	Abilityto**implementComputer forensicstoprotectDevicesfromattacks(BL-3)**
CO 5	Abilityhowto **implementProtectthenetworkfrombothinternalandexternalattacks(BL-1)**

CO-POMapping

CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1												1	
CO2	2	2	2										2	
CO3	2	3											1	
CO4	2	2	2	3									2	2
CO5	1	1	3											2

1:Low,2-Medium,3-High

COURSECONTENT

MODULE – 1	Cyber Crime	9 H

Cybercrime:Mobile and Wireless devices-Trend mobility-authentication service security-Attacks on mobile phones-mobile phone security Implications for organizations, Organizational measurement for Handling mobile-Security policies and measures in mobile computing era. Cases.

AttheendoftheModule1,studentswillbeableto:

1. Importanceand Need of security**(BL - 2)**
2. Organizational security importance**(BL - 2)**
3. Security for Hand-Held devices at the time of access internet**(BL - 2)**

MODULE -2	**Tools and Methods – Cyber Crime**	**9 H**

Tools and methods - Cyber Crime-Proxy servers and Anonymizers- Phishing Password cracking-Keyloggers and Spy wares-Virus and worms-Trojan Horse and Backdoors-Steganography-SQLInjection-Buffer overflow-Attacks onwireless network. Cases.

AttheendoftheModule2,studentswillbeableto:

1. DifferentmethodsofcrackingData**(BL - 4)**
2. Awarenessofdifferenttypesofattacks**(BL - 4)**
3. Methodstohandledifferentattacks**(BL - 2)**

MODULE-3	**Computer Forensics**	**10 H**

Understanding ComputerForensics-Historical background of cyber forensic, Forensic analysisof e-mail-Digital forensic life cycle-Network forensic-Setting up a computer forensic Laboratory-RelevanceoftheOSI7LayermodeltocomputerForensicfromcomplianceperspectives.Cases**.**

AttheendoftheModule3,studentswillbeableto:

1. Forensicinnovationtoprotectdata**(BL - 4)**
2. Highendofcomputerforensicfor securecommunication**(BL - 2)**
3. Networkinterpretationforsecuredprocessinginnetworks**(BL - 4)**

MODULE-4	**Forensics on Hand Held Devices**	**10 H**

Forensic of Hand –Held Devices-Understanding cell phone working characteristics Hand-Helddevices and digital forensic- Toolkits for Hand-Held device-Forensic of i-pod and digital musicdevices-Techno legalChallengeswithevidencefromhand-heldDevices.

AttheendoftheModule4,studentswillbeableto:

1. ImplementationofForensiconhandhelddevices**(BL - 3)**
2. Differentdevicesusingforensics**(BL - 4)**
3. Legalchallengestoovercomeformattacksusingforensics**(BL - 4)**

MODULE-5	**Cyber Security-Applications**	**10 H**

CyberSecurity–Applications-Organizationalimplications-costofcybercrimesandIPRissues Webthreatsfororganizations:theevilsandPerils-SocialmediamarketingSecurityandprivacyImplications-Protecting peopleprivacyinthe organizationsForensicbestpracticesfor organizations Cases

AttheendoftheModule5,studentswillbeableto: 1. Socialmedia impact onorganizations(BL - 3) 2. Protectingthemselvesformsocialmedia(BL - 4) 3. Different Application where cyber security requirement is needed(BL - 4)
Totalhours: 48H

Contentbeyondsyllabus:

1.Digital Signature

2.Kerberos

3.Digitalcertificates

Self-Study:

Contentstopromoteself-Learning:

S. NO	Topic	CO	Reference
1	Cybersecurity&cybercrime	CO1	https://www.tutorialspoint.com/fundamentals_of_science_and_technology/cyber_crime_and_cyber_security.htm
2	Computer Forensics	CO2	https://www.geeksforgeeks.org/information-security-and-computer-forensics/
3	Cybersecurity Strategies	CO3	https://www.tutorialspoint.com/information_security_cyber_law/cyber_security_strategies.htm
4	DigitalSignatures	CO4	https://www.tutorialspoint.com/information_security_cyber_law/digital_and_electronic_signatures.htm
5	CyberSecurity Polices	CO6	https://www.tutorialspoint.com/information_security_cyber_law/policies_to_mitigate_cyber_risk.htm

TextBook(s):

1. Cryptography & Network Security by Behrouz A. Forouzan, TMH 2007.
2. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA

ReferenceBook(s):

1. Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.DavidIrwin.CRC Press T&F Group
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education, 2008.
3. Information Systems Security,Godbole,Wiley Student Edition.
4. Cryptography and Network Security by William Stallings, Fourth Edition,Pearson Education 2007.
5. Fundamentals of Computer Security , Springer.
6. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH

7. Computer Security Basics by Rick Lehtinen, Deborah Russell &G.T.Gangemi Sr., SPD O'REILLY 2006.
8. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

Online/WebResources:

1. http://index-of.es/Hack/Network%20Security%20Essentials%204th%20Edition.pdf
2. https://www.academia.edu/31141817/Introduction_to_Computer_Networks_and_Cybersecurity
3. www.tutorialpoint.com 4.www.geeksforgeeks.com