NARAYANA ENGINEERING COLLEGE::GUDUR

AUTONOMOUS

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.Tech – CSE - Course Structure, w.e.f AY:2024-25

DEPARTMENT VISION & MISSION

VISION OF THE DEPARTMENT

- To produce globally competent software professionals in the field of computer science and engineering to meet the needs of industry and society along with research and consultancy, lifelong learning, leadership qualities and ethics.

MISSION OF THE DEPARTMENT

- To deliver quality technical education by practicing innovative teaching learning processes making student's self-sufficient individuals
- To inculcate innovative thinking and problem solving skills in learners through training programs and collaborative interaction with industry.
- To develop professional behaviour with strong ethical values, leadership qualitiesand lifelong learning by providing value based education

PEOs, Pos, PSOs

PEOs

PEO 1: To attain higher position in career by exhibiting expertise in solving real world problems.

PEO 2: Fill technical gaps and take leadership roles and achieve substantive results for the development of organization.

PEO 3: Adapt to rapidly changing technologies through lifelong learning.

POs

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of

the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technologicalchange.

PSOs

PSO 1: Software Product Development: Apply the principles and practices of software Engineering for developing quality software applications

PSO 2: Employment: Get employed in industries through their knowledge attained in Basic and advanced programming languages, specialized software packages or become an entrepreneur.

I B.Tech I Semester (CSE)

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
	BSH	Communicative English	2	0	0	2	2	30	70	100
	BSH	Chemistry	3	0	0	3	3	30	70	100
	BSH	Linear Algebra & Calculus	3	0	0	3	3	30	70	100
	ES	Basic Electrical and Electronics Engineering	3	0	0	3	3	30	70	100
	ES	Introduction to Programming	3	0	0	3	3	30	70	100
	BSH	Communicative English Lab	0	0	2	2	1	30	70	100
	BSH	Chemistry Lab	0	0	2	2	1	30	70	100
	ES	Electrical and Electronics EngineeringLab	0	0	3	3	1.5	30	70	100
	ES	Introduction to Programming Lab	0	0	3	3	1.5	30	70	100
	BSH	Health and wellness, Yoga ,Sports and Hobby clubs	0	0	1	1	0.5	30	70	100
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Activity Point Programme	During the Semester				20 Pts			
			14	**0**	**11**	**25**	**19.5**	**300**	**700**	**1000**

I B.Tech II Semester (CSE)

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
	BSH	Engineering Physics	3	0	0	3	3	30	70	100
	BSH	Differential Equations & Vector Calculus	3	0	0	3	3	30	70	100
	ES	Basic Civil & Mechanical Engineering	3	0	0	3	3	30	70	100
	ES	Engineering Graphics	1	0	4	5	3	30	70	100
	PC	Data Structures	3	0	0	3	3	30	70	100
	PC	Data Structures Lab	0	0	3	3	1.5	30	70	100
	ES	IT Workshop	0	0	2	2	1	30	70	100
	BSH	Engineering Physics Lab	0	0	2	2	1	30	70	100
	ES	Engineering Workshop	0	0	3	3	1.5	30	70	100
	BSH	NSS/NCC/Scouts & Guides/Community Service, Technical clubs and professional societies	0	0	1	1	0.5	30	70	100
		Counselling/Mentoring	0	0	1	1	0	--	--	--
		Activity Point Programme	During the Semester				20 Pts			
			13	**0**	**15**	**28**	**20.5**	**300**	**700**	**100**

II B.Tech I Semester (CSE)

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
23A54301	BS&H	Discrete Mathematics & Graph Theory	3	0	0	3	3	30	70	100
23A52301	BS&H	Universal Human Values Understanding Harmony And Ethical human conduct	2	1	0	3	3	30	70	100
23A30402	ES	Digital Logic and Computer Organization	3	0	0	3	3	30	70	100
23A05302T	PC	Advanced Data Structures & Algorithms Analysis	3	0	0	3	3	30	70	100
23A05303T	PC	Object – Oriented Programming Through JAVA	3	0	0	3	3	30	70	100
23A05302P	PC	Advanced Data Structures and Algorithms Analysis Lab	0	0	3	3	1.5	30	70	100
23A05303P	PC	Object – Oriented Programming Through JAVA Lab	0	0	3	3	1.5	30	70	100
23A05304	SE	Python programming	0	1	2	3	2	30	70	100
23A99301	AC	Environmental Science	2	0	0	2	0		100	100
	SC	Career competency Development I	0	0	2	2	0	30	70	100
	SC	Value added course/Certificate course I	0	0	0	0	0	30	70	100
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester				20 Pts			
			16	**2**	**13**	**31**	**20**	**300**	**800**	**1100**

II B.Tech II Semester (CSE)

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
23A52402a	MC	Managerial Economics and Financial Analysis	2	0	0	2	2	30	70	100
23A54401	ES	Probability & Statistics	3	0	0	3	3	30	70	100
23A35401T	PC	Operating Systems	3	0	0	3	3	30	70	100
23A05402T	PC	Database Management Systems	3	0	0	3	3	30	70	100
23A05403	PC	Software Engineering	3	0	0	3	3	30	70	100
23A35401P	PC	Operating Systems Lab	0	0	3	3	1.5	30	70	100
23A05402P	PC	Database Management Systems Lab	0	0	3	3	1.5	30	70	100
23A52401	SE	FullStackDevelopment-1	0	1	2	3	2	30	70	100
23A99401	BS&H	Design Thinking & Innovation	1	0	2	3	2	30	70	100
	SC	Career competency Development I	0	0	2	2	0	30	70	100
	SC	IndustryOriented Course I	0	0	0	0	0	30	70	100
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester				20 Pts			
			15	**1**	**15**	**31**	**21**	**330**	**770**	**1100**
Mandatory: Community Service Project Internship of 08 weeks duration during summer vacation										

III B.Tech I Semester (CSE)

SEMESTER –V

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
	PC	Artificial Intelligence	3	0	0	3	3	30	70	100
	PC	Computer Networks & Internet Protocols	3	0	0	3	3	30	70	100
	PC	Automata Theory and Compiler Design	3	0	0	3	3	30	70	100
	PC	Introduction To Quantum Technologies And Applications	3	0	0	3	3	30	70	100
	PE	**Professional Elective-I** 1. Object Oriented Analysis and Design 2. Soft Computing 3. Microprocessors & Microcontrollers 4. Data Warehousing & Data Mining	3	0	0	3	3	30	70	100
	OE	Open Elective-I English for Competitive Examinations	3	0	0	3	3	30	70	100
	PC	Artificial Intelligence Lab	0	0	3	3	1.5	30	70	100
	PC	Computer Networks & Internet Protocols Lab	0	0	3	3	1.5	30	70	100
	SE	Full Stack development - II	0	1	2	3	2	30	70	100
	ES	Tinkering Lab	0	0	2	2	1	30	70	100
	Internship	Evaluation of Community Service Internship	-	-	-	-	2	--	--	--
	SC	Value added course/Certificate course - II	0	0	0	0	0	30	70	100
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester				20 Pts			
			18	**1**	**13**	**32**	**26**	**330**	**700**	**1100**

Open Elective – I

S.No.	Course Code	Course Name	Offered by the Dept.
1	23A01505a	Green Buildings	CIVIL
2	23A01505b	Construction Technology and Management	
3	23A02505	Electrical Safety Practices and Standards	EEE
4	23A03505	Sustainable Energy Technologies	ME
5	23A04505	Electronic Circuits	ECE
	23A05505c	Quantum Technologies And Applications	CSE & Allied
6	23A54501	Mathematics for Machine Learning and AI	Mathematics
7	23A56501	Materials Characterization Techniques	Physics
8	23A51501	Chemistry of Energy Systems	Chemistry
9	23A52502a	English for Competitive Examinations	Humanities
10	23A52502b	Entrepreneurship and New Venture Creation	

Note:

1. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.
2. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.
3. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline.

IV B.Tech II Semester (CSE)

SEMESTER –VI

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
23A31401T	PC	Machine Learning	3	0	0	3	3	30	70	100
23A37501T	PC	Cloud Computing	3	0	0	3	3	30	70	100
23A05601T	PC	Cryptography & Network Security	3	0	0	3	3	30	70	100
23A05602a 23A38502 23A05602b 23A05602c	PE	**Professional Elective-II** 1. Software Testing Methodologies 2. Cyber Security 3. DevOps 4. Embedded Systems Design	3	0	0	3	3	30	70	100
23A05603a 23A05603b 23A31501 23A05603c	PE	**Professional Elective-III** 1. Software Project Management 2. Mobile Adhoc Networks 3. Natural Language Processing 4. Distributed Operating System	3	0	0	3	3	30	70	100
	OE	Open Elective-II	3	0	0	3	3	30	70	100
23A31401P	PC	Machine Learning Lab	0	0	3	3	1.5	30	70	100
23A05601P	PC	Cryptography and Network Security Lab	0	0	3	3	1.5	30	70	100
23A52501	SE	Soft skills (or) IELTS	0	1	2	3	2	30	70	100
23A52601	AC	Technical Paper Writing & IPR	2	0	0	2	0	--	100	100
23A05604		Workshop	0	0	0	0	0			
	SC	Industry Oriented Course - II	0	0	0	0	0	30	70	100
		Counseling / Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semest				20 Pts			
			20	**1**	**11**	**32**	**23**	**300**	**800**	**1100**
Mandatory Industry Internship of 08 weeks duration during summer vacation										

Open Elective – II

S.No.	Course Code	Course Name	Offered by the Dept.
1	23A01606a	Disaster Management	CIVIL
2	23A01606b	Sustainability In Engineering Practices	
3	23A02605	Renewable Energy Sources	EEE
4	23A03606	Automation and Robotics	ME
5	23A04606	Digital Electronics	ECE
6	23A54601a	Optimization Techniques for Engineers	Mathematics
7	23A54601b	Mathematical Foundation Of Quantum Technologies	
8	23A56601	Physics Of Electronic Materials And Devices	Physics
9	23A51601	Chemistry Of Polymers And Applications	Chemistry
10	23A52602	Academic Writing and Public Speaking	Humanities

V B.Tech I Semester (CSE)

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
23A30602T	PC	Deep Learning	2	1	0	3	3	30	70	100
23A52701a 23A52701b 23A52701c	PC	**Management Course- II** 1. Business Ethics and Corporate Governance 2. E-Business 3. Management Science	2	0	0	2	2	30	70	100
23A05701a 23A05701b 23A05701c 23A3501T	PE	**Professional Elective-IV** 1. Software Architecture & Design Patterns 2. Blockchain Technology 3. Augmented Reality & Virtual Reality 4. Internet of Things	3	0	0	3	3	30	70	100
23A05702a 23A05702b 23A05702c 23A05702d	PE	**Professional Elective-V** 1. Agile methodologies 2. Metaverse 3. Computer Vision 4. Cyber Physical Systems	3	0	0	3	3	30	70	100
	OE	**Open Elective-III**	3	0	0	3	3	30	70	100
	OE	**Open Elective-IV**	3	0	0	3	3	30	70	100
23A05703	SE	Prompt Engineering	0	1	2	3	2	30	70	100
23A52702	AC	Gender Sensitization	2	0	0	2	0	--	100	100
23A05704		Evaluation of Industry Internship	-	-	-	-	2			
	SC	Industry Oriented Course - II	0	0	0	0	0	30	70	100
		Counseling / Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semeste				20 Pts			
			18	**2**	**5**	**25**	**21**	**270**	**630**	**900**

Open Elective – III

S.No	Course Code	Course Name	Offered by the Dept.
1	23A01704a	Building Materials and Services	CIVIL
2	23A01704b	Environmental Impact Assessment	
3	23A02704	Smart Grid Technologies	EEE
4	23A03704	3D Printing Technologies	ME
5	23A04503T	Microprocessors and Microcontrollers	ECE
6	23A54701	Wavelet transforms and its Applications	Mathematics
7	23A56701a	Smart Materials and Devices	Physics
8	23A56701b	Introduction to Quantum Mechanics	
9	23A51701	Green Chemistry and Catalysis for Sustainable Environment	Chemistry
10	23A52703	Employability Skills	Humanities

Open Elective – IV

S.No	Course Code	Course Name	Offered by the Dept.
1	23A01705a	Geo-Spatial Technologies	CIVIL
2	23A01705b	Solid Waste Management	
3	23A02705	Electric Vehicles	EEE
4	23A03705	Total Quality Management	ME
5	23A04704	Transducers and Sensors	ECE
6	23A32603	Introduction to Quantum Computing	CSE & Allied
7	23A54702	Financial Mathematics	Mathematics
8	23A56702	Sensors And Actuators For Engineering Applications	Physics
9	23A51702	Chemistry Of Nanomaterials and Applications	Chemistry
10	23A52704	Literary Vibes	Humanities

IV B.Tech II Semester (CSE)

S.No.	Course code	Title	Category	L	T	P	Credits
1	23A05801	Internship		-	-	-	4
2	23A05802	Project		-	-	-	8
Total							**12**

COURSES OFFERED FOR HONOURS DEGREE IN CSE

S.No.	Course Code	Course Title	Contact Hours per week			Credits
			L	T	P	
1	23A32603	Quantum Computing	3	0	0	3
2	23A30702d	No SQL Databases	3	0	0	3
3	23A05H01	Software Defined Data Centre	3	0	0	3
4	23A05H02	Robotics and Intelligent Systems	3	0	0	3
5	23A05H03	Cloud Security	3	0	0	3
6	23A05H04	No SQL Lab	0	0	3	1.5
7	23A05H05	Quantum & Cloud Computing Lab	0	0	3	1.5

LIST OF MINORS OFFERED TO CSE

S.No.	Minor Title	Department offering the Minor
1	Building Planning & Construction Technology	Civil
2	Micro Grid Technology	EEE
3	Energy Systems	
4	3D Printing	ME
5	Industrial Engineering	
6	Embedded Systems and IoT	ECE & VLSI
7	Electronic Systems	

NARAYANA ENGINEERING COLLEGE::GUDUR								
SEM-I	**INTRODUCTION TO PROGRAMMING**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23ES1001	3	0	0	50	3	30	70	100

Course Objectives:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- Tofamiliarizestudentswithprogrammingconceptssuchasdatatypes,controlstructures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

Course Outcomes: A student after completion of the course will be able to	
CO1	Describe basics of computers, the concept of algorithm and algorithmic thinking.
CO2	Analyze a problem and develop an algorithm to solve it.
CO3	Illustrate various algorithms using the C programming language.
CO4	Explain more advanced features of C language.
CO5	Developproblem-solvingskillsandtheabilitytodebugandoptimizethecode.

COURSE CONTENT		
MODULE – 1	**Introduction**	**8H**
History of Computers, Basic organization of a computer - ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool), pseudocode. Introduction to Compilation andExecution,PrimitiveDataTypes,Variables,andConstants,BasicInputandOutput,Operations, TypeConversion,andCasting. **Problem solving techniques –**Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.		
MODULE – 2	**Control Structures**	**9H**
Conditional Control - Introduction, Simple sequential programs Conditional Statements (if, if-else, switch) **Looping Control** - Loops (for, while, do-while) Breakand Continue.		

MODULE – 3	Arrays and Strings	12H
Arrays- Indexing, memory model, programs with array of integers, two dimensional arrays **Strings** – Declaration, Initialization, Printing Strings, String Input, Character Manipulation, String Manipulation, Arrays of Strings, String Operations.		
MODULE – 4	**Pointers & User Defined Data types**	**9H**
Pointers –Definition, Dereferencingandaddressoperators,pointerandaddressarithmetic,arraymanipulationusingpointers **User-defined data types**-Structures and Unions.		
MODULE – 5	**Functions & File Handling**	**12H**
Functions - FunctionDeclarationandDefinition,FunctioncallReturnTypesandArguments,modifyingparametersinsidefunctionsusingpointers,arraysasparameters.ScopeandLifetimeofVariables,**Basics ofFile Handling** – Introduction, Using Data Files in C, Working with Text Files, Random Access to Files		
Note: ThesyllabusisdesignedwithCLanguageasthefundamentallanguageofimplementation**.**		
	Total hours:	**50 hours**

TEXT BOOK:

1. **C Programming, A Problem Solving Approach**, Forouzan, Gilberg, Prasad,CENGAGE,3rd edition
2. Schaum'sOutlineof**ProgrammingwithC**,ByronSGottfried,McGraw-HillEducation,1996

REFERENCES:

1. **ComputingfundamentalsandCProgramming**,Balagurusamy,E.,McGraw-HillEducation,2008.
2. **Programming in C**, RemaTheraja, Oxford, 2016,2nd edition
3. **TheCProgrammingLanguage**,BrianW.KernighanandDennisM.Ritchie,Prentice-Hall,1988

NARAYANA ENGINEERING COLLEGE::GUDUR								
SEM-I	**INTRODUCTION TO PROGRAMMING LAB**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	0	0	3	50	1.5	30	70	100

Course Objectives:

The course aims to give students hands – on experience and train them on the concepts of the C- programming language.

Course Outcomes: A student after completion of the course will be able to	
CO1	Read, understand, and trace the execution of programs written in C language.(BL2)
CO2	Select the right control structure for solving the problem.(BL3)
CO3	Develop C programs which utilize memory efficiently using programming constructs like pointers.(BL3)
CO4	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.(BL3)

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	2	1	2	2	1	2	1	2	1	2	1
CO2	2	3	2	1	2	2	3	2	2	2	2	2	2	2
CO3	2	2	3	2	3	2	2	2	2	3	2	3	2	1
CO4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1-Low, 2-Medium, 3- High														

COURSE CONTENT	
MODULE-1	
TASK-1	
Objective: Getting familiar with the programming environment on the computer and writing the first program.	

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment
Basic Linux environment and its editors like Vi, Vim & Emacs etc.
Exposure to Turbo C, gcc
Writing simple programs using printf(), scanf()

TASK-2	
Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.	

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.
Lab 1: Converting algorithms/flow charts into C Source code.
Developing the algorithms/flowcharts for the following sample programs
Sum and average of 3 numbers
Conversion of Fahrenheit to Celsius and vice versa
Simple interest calculation : 50 Hrs

TASK-3	
Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.	

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

i. Finding the square root of a given number
ii. Finding compound interest
iii. Area of a triangle using heron's formulae
iv. Distance travelled by an object

MODULE-2	
TASK-4	
Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.	

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: Simple computational problems using the operator' precedence and associativity
Evaluate the following expressions.

a. A+B*C+(D*E) + F*G
b. A/B*C-B+A*D/3
c. A+++B---A
d. J= (i++) + (++i)

ii. Find the maximum of three numbers using conditional operator
Take marks of 5 subjects in integers, and find the total, average in float

TASK-5	

Objective: Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.
Write a C program to find the max and min of four numbers using if-else.
Write a C program to generate electricity bill.
Find the roots of the quadratic equation.
Write a C program to simulate a calculator using switch case.
Write a C program to find the given year is a leap year or not.

TASK-6	

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series
Find the factorial of given number using any loop.
Find the given number is a prime or not.
Compute sine and cos series
Checking a number palindrome
Construct a pyramid of numbers.

MODULE-3

TASK-7	

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7:1D Array manipulation, linear search
i.Find the min and max of a 1-D integer array.

ii. Perform linear search on1D array.
iii. The reverse of a 1D integer array
iv. Find 2's complement of the given binary number.
v. Eliminate duplicate elements in an array.

TASK-8

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

Addition of two matrices
Multiplication two matrices
Sort array elements using bubble sort
Concatenate two strings without built-in functions
Reverse a string using built-in and without built-in string functions

MODULE-4

TASK-9

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

Write a C program to find the sum of a 1D array using malloc()
Write a C program to find the total, average of n students using structures
Enter n students data using calloc() and display failed students list
Read student name and marks from the command line and display the student details along with the total.
Write a C program to implement realloc()

TASK-10

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 10: Bitfields, Self-Referential Structures, Linked lists

Lab10 : Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields
Create and display a singly linked list using self-referential structure.
Demonstrate the differences between structures and unions using a C program.
Write a C program to shift/rotate using bitfields.
Write a C program to copy one structure variable to another structure of the same type.

MODULE-5

TASK-11	
Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration	

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

Write a C function to calculate NCR value.
Write a C function to find the length of a string.
Write a C function to transpose of a matrix.
Write a C function to demonstrate numerical integration of differential equations using Euler's method

TASK-12	
Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.	

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

Write a recursive function to generate Fibonacci series.
Write a recursive function to find the lcm of two numbers.
Write a recursive function to find the factorial of a number.
Write a C Program to implement Ackermann function using recursion.
Write a recursive function to find the sum of series.

TASK-13	
Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers	

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

Write a C program to swap two numbers using call by reference.
Demonstrate Dangling pointer problem using a C program.
Write a C program to copy one string into another using pointer.
Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

TASK-14	
Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.	

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

Write a C program to write and read text into a file.

Write a C program to write and read text into a binary file using fread() and fwrite() Copy the contents of one file to another file. Write a C program to merge two files into the third file using command-line arguments. Find no. of lines, words and characters in a file Write a C program to print last n characters of a given file.	
TOTAL HOURS	50 Hrs

Textbooks:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

	DATA STRUCTURES							R23
SEM-II	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	3	0	0	48	3	30	70	100

Pre-requisite: Basics of programming Language.

Course Objectives:

- Understand the significance of linear data structures in problem-solving and basic time/space complexity analysis.
- Create and manage linked lists to efficiently organize and manipulate data, emphasizingmemory efficiency.
- Implement and apply stacks to manage program flow and solve problems involving expression evaluation and backtracking.
- Utilize queues to model real-world scenarios, such as process scheduling and breadth-first search algorithms and understand the versatility of deques and prioritize data management using priority queues.
- Explore basic concepts of hashing and apply it to solve problems requiring fast data retrieval and management.

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

CO 1	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
CO 2	Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
CO 3	Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
CO 4	Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges
CO 5	Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems

COURSE CONTENT		
MODULE – 1	**Introduction**	**10H**
Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures.		
MODULE -2	**Linked Lists**	10H
Singly linked lists: Representation and operations, Doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.		
MODULE-3	**Stacks**	10H
Introduction to stacks: properties and operations, Implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.		
MODULE-4	**Queues and Trees**	9H
Queues: Introduction to queues: properties and operations, Implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc., Deques and operations and applications **Trees:** Introduction, Basic Terminologies, Definition and concepts, Representation of Binary Tree, operations on a Binary Tree, Binary Search Tree		
MODULE-5	**Graphs and Hashing**	9H
Graphs: Introduction, Graph Terminologies, Representation of Graphs, Graph Operations, Shortest Paths, Topological Sorting **Hashing:** Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.		
	Total hours:	**48 HOURS**

Content Beyond Syllabus:

1. B-Trees
2. Sorting and Searching Fundamentals

Text Books:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta.

Reference Book(s):

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and PeterSanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E.Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and DavidRanum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick

NARAYANA ENGINEERING COLLEGE:GUDUR

	DATA STRUCTURES LAB							R23
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
II	0	0	3	32	1.5	30	70	100

Pre-requisite: Programming Knowledge

Course Objectives:

- Understand the significance of linear data structures in problem-solving and basic time/space complexity analysis.
- Create and manage linked lists to efficiently organize and manipulate data, emphasizingmemory efficiency.
- Implement and apply stacks to manage program flow and solve problems involving expression evaluation and backtracking.
- Utilize queues to model real-world scenarios, such as process scheduling and breadth- first search algorithms and understand the versatility of deques and prioritize data management using priority queues.
- Explore basic concepts of hashing and apply it to solve problems requiring fast data retrieval and management.

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

CO1	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms
CO2	Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation
CO3	Develop programs using stacks to handle recursive algorithms, manage program states,and solve related problems
CO4	Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges
CO5	Recognize scenarios where hashing is advantageous, and design hash-based solutionsfor specific problems

CO-PO Mapping

CO	**PO**												**PSO**	
	PO1	**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										1	
CO2	2	3	2	2									2	1
CO3	2	2	3	2	2								3	2
CO4	2	2	2	1	1								3	2
CO5	2	2	2	1	1								3	3

1-Low, 2-Medium, 3- High

COURSE CONTENT	**CO**
Task-1 - Array Manipulation (2 H)	
i) Implement basic operations on arrays: insertion, deletion, searching. ii) Create a program to find the maximum and minimum elements in an array. iii) Write a program to reverse an array.	CO 1
Task-2 - Linked List Implementation (4H)	

i) Implement a singly linked list and perform insertion and deletion operations. ii) Develop a program to reverse a linked list iteratively and recursively. iii) Solve problems involving linked list traversal and manipulation.	CO 1
TASK-3 - Linked List Applications (4H)	
1. Write a function that draws a Pyramid with # symbols	CO 2
i) Create a program to detect and remove duplicates from a linked list. ii) Implement a linked list to represent polynomials and perform addition. iii) Implement a double-ended queue (deque) with essential operations.	
TASK-4 - Double Linked List Implementation (4H)	
i) Implement a doubly linked list and perform various operations to understand itsproperties and applications. ii) Implement a circular linked list and perform insertion, deletion, and traversal	CO 2
TASK-5 - Stack Operations (4H)	
i) Implement a stack using arrays and linked lists. ii) Write a program to evaluate a postfix expression using a stack. iii) Implement a program to check for balanced parentheses using a stack.	CO 2
TASK-6 - Queue Operations (4H)	
i) Implement a queue using arrays and linked lists. ii) Develop a program to simulate a simple printer queue system. iii) Solve problems involving circular queues.	CO3
TASK-7 – Stack and Queue Applications (4 H)	
i) Use a stack to evaluate an infix expression and convert it to postfix. ii) Create a program to determine whether a given string is a palindrome or not. iii) Implement a stack or queue to perform comparison and check for symmetry.	CO 4
TASK-8 – Graphs & Hashing (4H)	
i) Implement Graph Traversals of DFS, BFS ii) Implement a hash table with collision resolution techniques. iii) Write a program to implement a simple cache using hashing.	CO 4

ADDITIONAL EXPERIMENTS	
TASK –09– Trees and Graphs	
i) Binary Tree Traversals ii) Topological Sorting	CO2

Text Book(s):

1. Data Structures and algorithm analysis in C, Mark Allen Weiss.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta.

Reference Book(s):

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and PeterSanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E.Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and DavidRanum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting,Searching, and Graph Algorithms by Robert Sedgewick.

SEM-II	IT WORKSHOP							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23ES1504	0	0	2	50	1.0	30	70	100

Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

Course Outcomes: A student after completion of the course will be able to	
CO1	Perform Hardware troubleshooting.(BL3)
CO2	Understand Hardware components and inter dependencies.(BL2)
CO3	Analyze Safeguard computer systems from viruses/worms.(BL4)
CO4	Create document/ Presentation preparation.(BL6)
CO5	Perform calculations using spreadsheets(BL3).

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	1	1	2							1	2	1
CO2	2	2	1	1	2							2	2	2
CO3	2	2	3	1	2							2	2	1
CO4	2	2	1	1	2					1		2	2	2
CO5	2	2	1	1	2							2	2	2
1-Low, 2-Medium, 3- High														

COURSE CONTENT	
PC HARDWARE & SOFTWARE INSTALLATION	
TASK-1	**CO1**
Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.	

TASK-2	CO2
Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.	
TASK-3	**CO2**
Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.	
TASK-4	**CO2**
Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VM Ware) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva	
TASK-5	**CO2**
Every student should install BOSS on the computer. The system should be configured as dual boot (VM Ware) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva	
INTERNET & WORLD WIDE WEB	
TASK-6	**CO3**
Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.	
TASK-7	**CO3**
Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.	
TASK-8	**CO3**
Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.	
TASK-9	**CO3**
Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.	
MS -WORD	
TASK-10	**CO4**
Word Orientation: The mentor needs to give an overview of Microsoft (MS) office or equivalent (FOSS) tool word: Importance of MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.	
TASK-11	**CO4**
Using Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.	
TASK-12	**CO4**
Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and	

Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.	
TASK-13	**CO4**
Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.	
MS-EXCEL	
TASK-14	**CO5**
Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Managing the worksheet environment, Creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells, overview of toolbars, saving excel files, Using help and resources.	
TASK-15	**CO5**
Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text	
TASK-16	**CO5**
Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function	
TASK-17	**CO5**
LOOKUP/VLOOKUP	
Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting	
POWER POINT	
TASK-18	**CO4**
Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.	
TASK-19	**CO4**
Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.	
TASK-20	**CO4**
Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.	
AI TOOLS – CHATGPT	
TASK-21	
Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them. • Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"	
TASK-22	
Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas • Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."	

TASK-23	
Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are. • Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"	
TOTAL HOURS	**50 Hrs**

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition

NARAYANAENGINEERINGCOLLEGE:GUDUR								
III Sem	**DISCRETE MATHEMATICS & GRAPH THEORY**							R23
Course Code	Hours/Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A54301	3	0	0	48	3	30	70	100

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Apply mathematical logic to solve problems.(BL1, BL3)
CO 2	Understand the concepts and perform the operations related to sets, relations and functions. Gain the conceptual background needed and identify structures of algebraic nature. (BL3, BL5)
CO 3	Apply basic counting techniques to solve combinatorial problems. (BL3)
CO 4	Formulate problems and solve recurrence relations. (BL2, BL3)
CO 5	Apply Graph Theory in solving computer science problems. (BL3, BL5)

COURSECONTENT		
MODULE– 1	**Mathematical Logic**	**9H**
Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.		
MODULE– 2	**Set Theory**	**10H**
The Principle of Inclusion- Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.		
MODULE– 3	**Elementary Combinatorics**	**10H**
Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.		
MODULE– 4	**Recurrence Relations**	**10H**
Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous, Recurrence Relations.		
MODULE– 5	**Graphs**	**9H**
Basic Concepts, Isomorphism and Sub graphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi graphs and Euler Circuits, Hamiltonian Graphs.		
	Total hours:	**48hours**

TEXTBOOK:

1. J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.

2. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.

REFERENCES:

1. JoeL.Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.

2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science.

Online Learning Resources:

1. http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

NARAYANAENGINEERINGCOLLEGE:GUDUR								
III Sem	DIGITAL LOGIC & COMPUTER ORGANIZATION							R23
Course Code	Hours/Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A30402	3	0	0	48	3	30	70	100

Course Objectives:

The main objective of the course is to

- providestudentswithacomprehensiveunderstandingofdigitallogicdesign principles and computer organization fundamentals
- Describe memory hierarchy concepts
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices

CourseOutcomes: After successful completion of this course, the students should be able to:

CO 1	Differentiate between combinational and sequential circuits based on their characteristics and functionalities. **(BL2)**
CO 2	Demonstrate an understanding of computer functional units.**(BL2)**
CO 3	Analyze the design and operation of processors, including instruction execution, pipelining, and control unit mechanisms, to comprehend their role in computer systems.**(BL3)**
CO 4	Describe memory hierarchy concepts, including cache memory, virtual memory, and secondary storage, and evaluate their impact on system performance and scalability. **(BL3)**
CO 5	Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices, including interrupts, DMA, and I/O mapping techniques. **(BL3)**

COURSECONTENT		
MODULE– 1		**9H**
Data Representation: Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes **Digital Logic Circuits-I:** Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers		
MODULE– 2		**10H**
Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters **Basic Structure of Computers:** Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von- Neumann Architecture		
MODULE– 3		**10H**
Computer Arithmetic : Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations **Processor Organization:** Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control		
MODULE– 4		**10H**
The Memory Organization: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage		
MODULE– 5		**9H**
Input /Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces		
	Totalhours:	**48hours**

Textbooks:

1. Computer Organization, CarlHamacher, ZvonkoVranesic, SafwatZaky, 6th edition, McGraw Hill, 2023.
2. Digital Design, 6th Edition, M. MorrisMano, PearsonEducation,2018.

ComputerOrganizationandArchitecture,WilliamStallings,11th Edition,Pearson, 2022.

Reference Books:

1. Computer Systems Architecture, M. MorisMano,3rd Edition, Pearson, 2017.
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier, 2004.
3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson, 2003.

Online Learning Resources:

https://nptel.ac.in/courses/106/103/106103068/

NARAYANAENGINEERINGCOLLEGE:GUDUR								
III Sem	**ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS**							**R23**
Course Code	Hours/Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05302T	3	0	0	48	3	30	70	100

Course Objectives: The main objective of the course is to

- Provide knowledge on advance data structures frequently used in Computer Science domain.
- Develop skills in algorithm design techniques popularly used.
- Understand the use of various data structures in the algorithm design.

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Illustrate the working of the advanced tree data structures and their applications.**(BL2)**
CO 2	Understand the Graph data structure, traversals and apply them in various contexts**. (BL2)**
CO 3	Use various data structures in the design of algorithms. **(BL3)**
CO 4	Recommend appropriate data structures based on the problem being solved. **(BL5)**
CO 5	Analyze algorithms with respect to space and time complexities. **(BL4)** Design new algorithms. **(BL6)**

COURSECONTENT		
MODULE– 1		**9H**
Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations. AVL Trees–Creation, Insertion, Deletion operations and Applications. Heap Trees (Priority Queues)–Min and Max Heaps, Operations and Applications.		
MODULE– 2		**10H**
Graphs: Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications **Divide and Conquer:** The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull		
MODULE– 3		**10H**
Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees. **Single Source Shortest Paths** –Dijkstra algorithm, General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees. **Dynamic Programming**: General Method, All pairs shortest paths		
MODULE– 4		**10H**
Dynamic programming: 0/1 Knapsack, String Editing, Travelling Salesperson problem. **Backtracking**: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem		
MODULE– 5		**9H**
Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem. **NP Hard and NP Complete Problems**: Basic Concepts, Cook's theorem **NP Hard Graph Problems**: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP) **NP Hard Scheduling Problems**: Job Shop Scheduling		
	Total hours:	**48hours**

Textbooks:

1. Fundamentals of Data Structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson – Freed, 2nd Edition, Universities Press
2. Computer Algorithms, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition, Silicon Press

Reference Books:

1. Data Structures and program designing C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley & Sorenson, Mc Graw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C&C++: Langsam, Augenstein & Tanenbaum, Pearson,1995
5. Algorithms + Data Structures & Programs: N. Wirth, PHI
6. Fundamentals of Data Structures in C++: Horowitz Sahni & Mehta, GalgottiaPub.
7. Data structures in Java: Thomas Standish, Pearson Education Asia

Online Learning Resources:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. Abdul Bari,1. Introduction to Algorithms(youtube.com)

NARAYANA ENGINEERING COLLEGE ::GUDUR								
III Sem	OBJECT – ORIENTED PROGRAMMING THROUGH JAVA							R23
Course Code	Hours/Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05303T	3	0	0	48	3	30	70	100

Course Objectives: The learning objectives of this course are to:

- Identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java ap is for program development

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Analyze problems, design solutions using OOP principles, and implement them efficiently in Java. (BL4)
CO 2	Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects (BL4)
CO 3	Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch. (BL3)
CO 4	Apply Competence in handling exceptions and errors to write robust and fault-tolerant code. (BL3)
CO 5	Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using Java FX. (BL3)
CO6	Choose appropriate data structure of Java to solve a problem(BL6)

COURSECONTENT		
MODULE– 1		**9H**

Object Oriented Programming: Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.
Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, **Introduction to Operators**, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.
Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

MODULE– 2		**10H**

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

MODULE– 3		**10H**

Arrays: Introduction,DeclarationandInitializationofArrays,StorageofArrayin ComputerMemory,AccessingElementsofArrays,OperationsonArrayElements,AssigningArray to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.
Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

MODULE– 4		**10H**

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto- unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.
Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

MODULE– 5		**9H**

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer. **Multithreaded Programming:** Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.	
Totalhours:	**48hours**

Text Books:

1. JAVA on estepahead, AnithaSeth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
3. JAVA9for Programmers, PaulDeitel, HarveyDeitel,4thEdition, Pearson.

References Books:

1. The complete Reference Java, 11thedition, HerbertSchildt, TMH
2. Introduction to Java programming,7thEdition,YDanielLiang, Pearson

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

III Sem	ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB							R23
Course Code	Hours/Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05302P	0	0	3	48	1.5	30	70	100

Course Objectives: The objective of the course is to

- acquire practical skills in constructing and managing Data structures
- apply the popular algorithm design methods in problem-solving scenarios

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Design and develop programs to solve real world problems with the popular algorithm design methods. **(BL5)**
CO 2	Demonstrate an understanding of Non-Linear data structures by developing implementing the operations on AVL Trees, B-Trees, Heaps and Graphs**.(BL2)**
CO 3	Critically assess the design choices and implementation strategies of algorithms and data structures in complex applications. (BL5)
CO 4	Utilize appropriate data structures and algorithms to optimize solutions for specific computational problems. **(BL3)**
CO 5	Compare the performance of different of algorithm design strategies. **(BL4)** Design algorithms to new real world problems. **(BL6)**

Experiments covering the Topics:

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees
- Shortest path algorithms
- 0/1KnapsackProblem
- Travelling Sales person problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

COURSE CONTENT	CO
List of Experiments	
TASK–1	**CO1**
Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.	
TASK–2	**CO1**
Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.	
TASK–3	**CO1**
Implement BFT and DFT for given graph, when graph is represented by a) Adjacency Matrix b)Adjacency Lists	
TASK–4	**CO2**
Write a program for finding the bi-connected components in a given graph.	
TASK–5	**CO2**
Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).	
TASK–6	**CO2**
Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.	
TASK–7	**CO3**
Implement Job sequencing with deadlines using Greedy strategy.	
TASK–8	**CO4**
Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.	
TASK–9	**CO5**
Implement N-Queens Problem Using Backtracking.	
TASK–10	**CO5**
Use Backtracking strategy to solve 0/1Knapsack problem.	
TASK–11	**CO5**
Implement Travelling Sales Person problem using Branch and Bound approach.	

Reference Books:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, SahniSartaj, Mehta, Dinesh, 2nd Edition, Universities Press
2. ComputerAlgorithms/C++EllisHorowitz,SartajSahni,SanguthevarRajasekaran, 2nd Edition, University Press
3. DataStructuresandprogramdesigninC,RobertKruse,PearsonEducationAsia
4. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill

Online Learning Resources:

1. http://cse01-iiith.vlabs.ac.in/
2. http://peterindia.net/Algorithms.html

NARAYANAENGINEERINGCOLLEGE ::GUDUR								
III Sem.	OBJECT - ORIENTED PROGRAMMING THROUGH JAVA LAB							R23
Course Code	Hours/Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05303P	0	0	3	48	1.5	30	70	100

Course Objectives: The aim of this course is to:

- Practice object – oriented programming in the Java programming language
- Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, Implement packages

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Demonstrate a solid understanding of Java syntax, including data types, control structures, methods, classes, objects, inheritance, polymorphism, and exception handling. **(BL2)**
CO 2	Apply fundamental OOP principles such as encapsulation, inheritance, polymorphism, and abstraction to solve programming problems effectively**.(BL3)**
CO 3	Familiar with commonly used Java libraries and APIs, including the Collections Framework, Java I/O, JDBC, and other utility classes. **(BL2)**
CO 4	Develop problem-solving skills and algorithmic thinking, applying OOP concepts to design efficient solutions to various programming challenges. **(BL3)**
CO 5	Proficiently construct Multithreaded programming, IO Files**(BL4)**
CO6	Develop new programs for solving typical computer science problems**(BL6)**

Experiments covering the Topics:

- Object Oriented Programming fundamentals – data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams

COURSE CONTENT	
List of Experiments	
Week–1	**CO1**
a) Write a JAVA program to display default value of all primitive data type of JAVA b) Write a java program that displaytherootsofaquadraticequation$ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.	
Week–2	**CO1**
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	
Week–3	**CO2**
a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method. b) Write a JAVA program implement method overloading.	
Week–4	**CO2**
a) Write a JAVA program to implement constructor. b) Write a JAVA program to implement constructor overloading.	
Week-5	**CO2**
a) Write a JAVA program that implements Runtime polymorphism b) Write a JAVA program implement method overriding.	
Week-6	**CO3**
a) Write a JAVA program for abstract class to find areas of different shapes b) Write Java program(s) on ways of implementinginterface.	
Week–7	**CO3**
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?	
Week–8	**CO3**
a) Write a JAVA program to Implement Single Inheritance. b) Write a JAVA program to implement multi level Inheritance	
Week–9	**CO4**
b) Write a JAVA program that describes exception handling mechanism c) Write a JAVA program Illustrating Multiple catch clauses	
Week–10	**CO4**
a) Write a JAVA program for creation of Java Built-in Exceptions. b) Write a JAVA program for creation of User Defined Exception.	
Week–11	**CO5**
a) Write a JAVA program that creates threads by extending Thread class. First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable) b) Write a program illustrating **isAlive()** and **join ()**	
Week-12	**CO5**

a) Write a JAVA program illustrative Daemon Threads

b) Write a JAVA program Producer-Consumer Problem

Additional Experiments

a) Design a simple calculator which performs all arithmetic operations. The interface should look like the calculator application of the operating system. Handle the exceptions ifany.
b) Write a Java Program that demonstrates Inner class.
c) Write a Java Program that demonstrate Command Line Arguments.

Textbooks:

1. JAVA one step ahead, AnithaSeth, B.L.Juneja, Oxford.
2. JoywithJAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
3. JAVA9forProgrammers,PaulDeitel,HarveyDeitel,4th Edition,Pearson

References Books:

1. The completeReferenceJava,11th edition,HerbertSchildt,TMH
2. IntroductiontoJavaprogramming,7th Edition,YDanielLiang,Pearson

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046454761881634 7

NARAYANAENGINEERINGCOLLEGE:GUDUR								
III Sem	PYTHON PROGRAMMING							R23
Course Code	Hours/Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05304	0	1	2	48	2	30	70	100

The main objectives of the course are to

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Classify data structures of Python(BL4)
CO 2	Apply Python programming concepts to solve a variety of computational problems (BL3)
CO 3	Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs (BL3)
CO 4	Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas (BL2)
CO 5	Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries (BL3)
CO6	Propose new solutions to computational problems(BL6)

COURSECONTENT		
MODULE– 1		**9H**

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers with in an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.

i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v)Bitwise Operators vi)Ternary Operator vii) Membership Operators viii) Identity Operators

5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

MODULE– 2		**10H**

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Writeaprogramtofindthelengthofthestringwithoutusinganylibraryfunctions.
4. Write a program to check if the sub string is present in a given string or not.
5. Write a program to perform the given operations on a list:
   i. Addition ii. Insertion iii. slicing
6. Writeaprogramtoperformany5 built-in functions by taking any list.

MODULE– 3		**10H**

Dictionaries: Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozen set.

Sample Experiments:

1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
2. Write a program to count the number of vowels in a string (No control flow allowed).
3. Write a program to check if a given key exists in a dictionary or not.
4. Write a program to add a new key-value pair to an existing dictionary.
5. Write a program to sum all the items in a given dictionary.

MODULE– 4		**10H**

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words and lines in a file.
4. Write a program to create, display, append, insert and reverse the order of the items in the array.
5. Write a program to add, transpose and multiply two matrices.
6. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

MODULE– 5		**9H**

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

1. Python program to check whether a JSON string contains complex object or not.
2. Python Program to demonstrate NumPy arrays creation using array() function.
3. Python program to demonstrate use of ndim, shape, size, dtype.
4. Python program to demonstrate basic slicing, integer and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of array
6. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
   a) Apply head() function to the pandas data frame
   b) Perform various data selection operations on Data Frame
7. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

Total hours:	**48hours**

Reference Books:

1. Gowri shankarS, VeenaA., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y.DanielLiang, Pearson.

Online Learning Resources /Virtual Labs:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

NARAYANA ENGINEERING COLLEGE:GUDUR								
IV Sem	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A52402a	2	0	0	48	2	30	70	100

Course Objectives:

- To inculcate the basic knowledge of micro economics and financial accounting
- To make the students learn how demand is estimated for different products, input- output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal method stop romote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Define the concepts related to Managerial Economics, financial accounting and management**(BL2)**
CO 2	Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets **(BL2)**
CO 3	Apply the Concept of Production cost and revenues for effective Business decision **(BL3)**
CO 4	Analyze how to invest their capital and maximize returns**(BL4)**
CO 5	Evaluate the capital budgeting techniques.**(BL5)**
CO 6	Developtheaccountingstatementsandevaluatethefinancialperformanceofbusiness entity **(BL5)**

COURSE CONTENT		
MODULE – 1	**Managerial Economics**	**9H**
Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand- Demand Elasticity- Types– Measurement. Demand Forecasting-Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.		
MODULE – 2	**Production and Cost Analysis**	**10H**
Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).		
MODULE – 3	**Business Organizations and Markets**	**10H**
Introduction – Forms of Business Organizations- Sole Proprietary - 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.		
MODULE – 4	**Capital Budgeting**	**10H**
Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. CapitalBudgeting–Features,Proposals,MethodsandEvaluation.Projects–PayBack Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)		
MODULE – 5	**Financial Accounting and Analysis**	**9H**
Introduction–Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.		
	Total hours:	**48 hours**

Text books:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.

Aryasri: BusinessEconomicsandFinancialAnalysis,4/e,MGH.

Reference Books:

1. AhujaHl Managerial economics Schand.
2. S.A.SiddiquiandA.S.Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. DomnickSalvatore: Managerial Economics in a Global Economy, Cengage.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

NARAYANA ENGINEERING COLLEGE:GUDUR								
IV Sem	PROBABILITY & STATISTICS							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A54401	3	0	0	48	3	30	70	100

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Acquire knowledge in finding the analysis of categorically and various statistical elementary tools.**(BL2,BL3)**
CO 2	Develop skills in designing mathematical models involving probability, random variables and the critical thinking in the theory of probability and its applications in real life problems. **(BL3,BL5)**
CO 3	Apply the theoretical probability distributions like binomial, Poisson, and Normal in the relevant application areas. **(BL3)**
CO 4	Analyze to test various hypotheses included in theory and types of errors for large samples. **(BL2,BL3)**
CO 5	Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real life problems. **(BL3,BL5)**

COURSE CONTENT		
MODULE – 1	**Descriptive statistics**	**9H**
Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Measures of Central tendency, Measures of Variability (spread or variance) Skewness, Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, method of least squares, regression lines.		
MODULE – 2	**Probability**	**10H**
Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.		
MODULE – 3	**Probability distributions**	**10H**
Probability distributions: Binomial, Poisson and Normal-their properties (Chebyshevs inequality). Approximation of the binomial distribution to normal distribution.		
MODULE – 4	**Estimation and Testing of hypothesis, large sample tests**	**10H**
Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems		
MODULE – 5	**Small sample tests**	**9H**
Student t-distribution (test for single mean, two means and pair edt-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes		
	Total hours:	**48 hours**

Textbooks:

1. Millerand Freunds, Probability and Statistics for Engineers,7/e,Pearson,2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. S.Ross, First Course in Probability, Pearson Education India,2002.
2. W.Feller, an Introduction to Probability Theory and its Applications,1/e,Wiley, 1968.
3. B.V.Ramana, Higher Engineering Mathematics, McGraw Hill Education.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://onlinecourses.nptel.ac.in/noc22_mg31/preview

NARAYANA ENGINEERING COLLEGE:GUDUR								
IV Sem	OPERATING SYSTEMS							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A35401T	3	0	0	48	3	30	70	100

Course Objectives: The main objectives of the course is to make student

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication. (L1)
CO 2	Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection. (L2)
CO 3	Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system. (L3)
CO 4	Illustrate different conditions for deadlock and their possible solutions.(L2)
CO 5	Analyze the memory management and its allocation policies.(L4)

COURSE CONTENT		
MODULE – 1		**9H**
Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems **System Structures:** Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging		
MODULE – 2		**10H**
Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication. **Threads and Concurrency:** Multithreading models, Thread libraries, Threading issues. **CPU Scheduling:** Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.		
MODULE – 3		**10H**
Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization. **Deadlocks:** system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.		
MODULE – 4		**10H**
Memory-Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping. **Virtual Memory Management:** Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing. **Storage Management:** Overview of Mass Storage Structure, HDD Scheduling.		
MODULE – 5		**9H**
File System: File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing. **Protection:** Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.		
	Total hours:	**48 hours**

Textbooks:

1. Operating System Concepts, Silberschatz A, GalvinPB, GagneG,10th Edition, Wiley, 2018.
2. ModernOperatingSystems,TanenbaumAS,4th Edition,Pearson,2016

Reference Books:

1. Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018
2. Operating Systems :A Concept Based Approach, D.MDhamdhere, 3rd Edition, McGraw- Hill, 2013

Online Learning Resources:

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

NARAYANA ENGINEERING COLLEGE:GUDUR								
IV Sem	DATABASE MANAGEMENT SYSTEMS							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05402T	3	0	0	48	3	30	70	100

Course Objectives: The main objective of the course is to

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Understand the basic concepts of database management systems**(BL2)**
CO 2	Analyze a given database application scenario to use ER model for conceptual design of the database **(BL4)**
CO 3	Utilize SQL proficiently to address diverse query challenges **(BL3).**
CO 4	Employ normalization methods to enhance database structure**(BL3)**
CO 5	Assess and implement transaction processing, concurrency control and database recovery protocols in databases. **(BL4)**

COURSE CONTENT		
MODULE – 1		**9H**
Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database. **Entity Relationship Model:** Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.		
MODULE – 2		**10H**
Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).		
MODULE – 3		**10H**
SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.		
MODULE – 4		**10H**
Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Loss less join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce - Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).		
MODULE – 5		**9H**
Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm. **Introduction to Indexing Techniques:** B+ Trees, operations on B+Trees, Hash Based Indexing:		
	Total hours:	**48 hours**

Textbooks:

1. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. DatabaseSystemConcepts,5thedition,Silberschatz,Korth,Sudarsan,TMH(For Chapter 1 and Chapter 5)

ReferenceBooks:

1. IntroductiontoDatabaseSystems,8thedition,CJDate,Pearson.
2. DatabaseManagementSystem,6thedition,RamezElmasri,ShamkantB.Navathe, Pearson
3. DatabasePrinciplesFundamentalsofDesignImplementationandManagement, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Web-Resources:

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

NARAYANA ENGINEERING COLLEGE:GUDUR								
IV Sem	SOFTWARE ENGINEERING							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05403	3	0	0	48	3	30	70	100

Course Objectives: The objectives of this course are to introduce

- Software life cycle models, Software requirements and SRS document.
- Project Planning, quality control and ensuring good quality software.
- Software Testing strategies, use of CASE tools, Implementation issues, validation & verification procedures.

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	PerformvariouslifecycleactivitieslikeAnalysis,Design,Implementation,Testing and Maintenance **(BL3)**
CO 2	Analyse various software engineering models and apply methods for design and development of software projects **(BL4)**
CO 3	Develop system designs using appropriate techniques **(BL3)**
CO 4	Understand various testing techniques for a software project **(BL2)**
CO 5	Apply standards, CASE tools and techniques for engineering software projects **(BL3)**

COURSE CONTENT		
MODULE – 1		**9H**
Introduction: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, No table changes in software development practices, Computer system engineering. **Software Life Cycle Models:** Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model.		
MODULE – 2		**10H**
Software Project Management: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management. **Requirements Analysis And Specification:** Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.		
MODULE – 3		**10H**
Software Design: Overview of the design process, How to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling, approaches to software design. **Agility:** Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Text Book 2) **Function-Oriented Software Design:** Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review. **User Interface Design:** Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.		
MODULE – 4		**10H**
Coding And Testing: Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing**,** Testing object-oriented programs, Smoke testing, and Some general issues associated with testing. **Software Reliability And Quality Management:** Software reliability. Statistical testing, Software quality, Software quality management system, ISO 9000. SEI Capability maturity model. Few other important quality standards, and Six Sigma**.**		
MODULE – 5		**9H**
Computer-Aided Software Engineering (Case): CASE and its scope, CASE environment, CASE support in the software lifecycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment. **Software Maintenance:** Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost. **Software Reuse:** reuse- definition, introduction, reason behind no reuse so far, Basic issues in any reuse program, A reuse approach, and Reuse at organization level.		
	Total hours:	**48 hours**

Text Books:

1. Fundamentals of Software Engineering, RajibMall, 5th Edition, PHI.
2. Software Engineering Apractitioner'sApproach, RogerS.Pressman, 9th Edition, Mc- Graw Hill International Edition.

Reference Books:

1. Software Engineering, IanSommerville,10th Edition,Pearson.
2. Software Engineering, Principles and Practices, DeepakJain, Oxford University Press.

e- Resources:

1) https://nptel.ac.in/courses/106/105/106105182/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview
3) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01338269041100390473 5_shared/overview

NARAYANA ENGINEERING COLLEGE:GUDUR								
IV Sem	**OPERATING SYSTEMS LAB**							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A35401P	0	0	3	48	1.5	30	70	100

Course Objectives: The main objectives of the course are to

- Provide insights into system calls, file systems, semaphores,
- Develop and debug CPU Scheduling algorithms, page replacement algorithms, thread implementation
- Implement Bankers Algorithms to Avoid the Dead Lock

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Trace different CPU Scheduling algorithms **(BL2)**
CO 2	Implement Bankers Algorithms to Avoid the Dead Lock **(BL3)**
CO 3	Evaluate Page replacement algorithms **(BL5)**
CO 4	Illustrate the file organization techniques **(BL4).**
CO 5	Illustrate Interprocess Communication and concurrent execution of threads **(BL4)**

Experiments covering the Topics:

- UNIX fundamentals, commands & system calls
- CPU Scheduling algorithms, thread processing
- IPC, semaphores, monitors, deadlocks
- Page replacement algorithms, file allocation strategies
- Memory allocation strategies

COURSE CONTENT	CO
List of Experiments	
TASK–1	**CO1**
1. Practicing of Basic UNIX Commands.	
TASK–2	
2. Write programs using the following UNIX operating system calls fork, exec, getpid, exit, wait, close, stat, opendir and readdir	
TASK–3	**CO1**
3. Simulate UNIX commands like cp, ls, grep etc.,	
TASK–4	**CO1**
4. Simulate the following CPU scheduling algorithms a)FCFS b) SJF c) Priority d) Round Robin	
TASK–5	**CO2**
5. Control the number of ports opened by the operating system with a) Semaphore b) Monitors.	
TASK–6	**CO2**
6. Write a program to illustrate concurrent execution of threads using p threads library.	
TASK–7	**CO2**
7. Write a program to solve producer – consumer problem using Semaphores.	
TASK–8	**CO3**
8. Implement the following memory allocation methods for fixed partition a) Firstfit b)Worstfit c) Bestfit	
TASK–9	**CO4**
9. Simulate the following page replacement algorithms **a)** FIFO b) LRU c) LFU	
TASK–10	**CO4**
10. Simulate Paging Technique of memory management.	
TASK–11	**CO4**
11. Implement Bankers Algorithm for Dead Lock avoidance and prevention	
TASK–12	**CO4**
12. Simulate the following file allocation strategies a) Sequential b) Indexed c) Linked	

Reference Books:

1. Operating System Concepts, SilberschatzA, GalvinPB,GagneG,10th Edition,Wiley, 2018.
2. ModernOperatingSystems,TanenbaumAS,4th Edition,Pearson,2016
3. Operating Systems –Internals and Design Principles, StallingsW, 9th edition, Pearson, 2018
4. OperatingSystems:AConceptBasedApproach,D.MDhamdhere,3rd Edition, McGraw-Hill, 2013

Online Learning Resources:

1. https://www.cse.iitb.ac.in/~mythili/os/
2. http://peterindia.net/OperatingSystems.html

IV Sem	DATABASE MANAGEMENT SYSTEMS LAB							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05402P	0	0	3	48	1.5	30	70	100

Course Objectives: This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers.

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Utilizing Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL) commands effectively within a database environment **(BL3)**
CO 2	Constructing and execute queries to manipulate and retrieve data from databases **(BL3)**
CO 3	Develop application programs using PL/SQL **(BL3)**
CO 4	Analyze requirements and design custom Procedures, Functions, Cursors, and Triggers, leveraging their capabilities to automate tasks and optimize database functionality **(BL4)**
CO 5	Establish database connectivity through JDBC(Java Database Connectivity) **(BL3)**

Experiments covering the topics:

- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming-control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity-ODBC/JDBC

COURSE CONTENT	**CO**
List of Experiments	
TASK–1	**CO1**
1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.	
TASK–2	
1. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example :- Select the roll number and name of the student who secured fourth rank in the class.	
TASK–3	**CO1**
1. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.	
TASK–4	**CO1**
1. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr andinstr),datefunctions(Sysdate,next_day,add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)	
TASK–5	**CO2**
1. i. Create a simple PL/SQL program which includes declaration section, executable section and exception–Handling section(Ex. Student mark scan be selected from the table and printed for those who secured first class and an exception can be raised if no records were found) ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.	
TASK–6	**CO2**
1. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.	
TASK–7	**CO2**
1. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.	
TASK–8	**CO3**

1. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.	
TASK–9	**CO4**
1. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.	
TASK–10	**CO4**
1. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.	
TASK–11	**CO4**
1. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers	
TASK–12	**CO4**
1. Create a table and perform the search operation on table using indexing and non-indexing techniques.	
TASK–13	**CO4**
1. Write a Java program that connects to a database using JDBC	
TASK–14	**CO4**
1. Write a Java program to connect to a data base using JDBC and insert values into it	
TASK–15	**CO4**
1. WriteaJavaprogramtoconnecttoadatabaseusingJDBCanddeletevaluesfromit	

Text Books / Suggested Reading:

1. Oracle: The Complete Reference by Oracle Press
2. NileshShah, "DatabaseSystemsUsingOracle",PHI,2007
3. RickFVanderLans,"IntroductiontoSQL",FourthEdition,PearsonEducation,2007

IV Sem	FULLSTACK DEVELOPMENT–1							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A52401	0	1	2	48	1.5	30	70	100

Course Objectives: The main objectives of the course are to

- Make use of HTML elements and their attributes for designing static WebPages
- Build a webpage by applying appropriate CSS styles to HTML elements
- Experiment with Java Script to develop dynamic web pages and validate forms

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Design Websites**.(BL6)**
CO 2	Apply Styling to WebPages. **(BL4)**
CO 3	Make WebPages interactive**.(BL6)**
CO 4	Design Forms for applications**.(BL6)**
CO 5	Choose Control Structure based on the logic to be implemented**.(BL3)**
CO6	Understand HTML tags, Attributes and CSS properties**(BL2)**

Experiments covering the Topics:

- Lists, Links and Images
- HTML Tables, Forms and Frames
- HTML5 and Cascading Style Sheets, Types of CSS
- Select or forms
- CSS with Color, Background, Font, Text and CSS Box Model
- Applying JavaScript-internal and external, I/O, Type Conversion
- JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
- JavaScript Functions and Events
- Node.js

COURSE CONTENT	**CO**
List of Experiments	
TASK–1	**CO1**
1. Lists, Links and Images a. Write a HTML program, to explain the working of lists. Note: It should have an ordered list, un ordered list, nested lists and ordered list in an unordered list and definition lists. b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target attributes. c. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles. d. Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique	
TASK–2	

2. HTML Tables, Forms and Frames

a. Write a HTML program, to explain the working of tables. (usetags:<table>,<tr>,<th>, <td>and attributes: border, rowspan, colspan)

b. Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).

c. Write a HTML program, to explain the working of forms by designing Registration form. (Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).

d. Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame image, second frame paragraph, third frame hyperlink. And also make sure of using "no frame" attribute such that frames to be fixed).

TASK–3	**CO1**

3. HTML5andCascadingStyleSheets,TypesofCSS

a. WriteaHTMLprogram,thatmakesuseof<article>,<aside>,<figure>,<figcaption>, <footer>,<header>,<main>,<nav>,<section>, ,tags.

b. Write a HTML program, to embed audio and video into HTML webpage.

c. Write a program to apply different types (or levels of styles or style specification formats) -inline,internal,externalstylestoHTMLelements.(identifyselector,propertyand value).

TASK–4	**CO1**

4. Selector forms

a. Write a program to apply different types of selector forms
- Simples elector (element, id, class, group, universal)
- Combinator selector (descendant, child, adjacent sibling, general sibling)
- Pseudo-class selector
- Pseudo-element selector
- Attribute selector

TASK–5	**CO2**

5. CSS with Color, Background, Font, Text and CSS Box Model

a. Write a program to demonstrate the various ways you can reference a color in CSS.

b. Write a CSS rule that places a background image halfway down the page, tilting It horizontally. The image should remain in place when the user scrolls up or down.

c. Write a program using the following terms related to CSS font and text:
i. font-size ii. font-weight iii. font-style
iv. text-decoration v. text-transformation vi. text-alignment

d. Writeaprogram,toexplaintheimportanceofCSSBoxmodelusing
i. Content ii. Border iii. Margin iv. padding

TASK–6	**CO2**

6. Applying JavaScript-internal and external, I/O, Type Conversion

a. Write a program to embed internal and external JavaScript in a webpage.
b. Write a program to explain the different ways for displaying output.
c. Write a program to explain the different ways for taking input.
d. Create a webpage which uses prompt dialogue box to ask a voter for his name and age. Display the information in table format along with either the voter can vote or not

TASK–7	CO2

7. Java Script Pre-defined and User-defined Objects

a. Write a program using document object properties and methods.
b. Write a program using window object properties and methods.
c. Write a program using array object properties and methods.
d. Write a program using math object properties and methods.
e. Write a program using string object properties and methods.
f. Write a program using regex object properties and methods.
g. Write a program using date object properties and methods.
h. Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

TASK–8	CO3

8. Java Script Conditional Statements and Loops

a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".
b. Write a program to display week days using switch case.
c. Write a program to print 1to10 numbers using for, while and do-while loops.
d. Writeaprogramtoprintdatainobjectusingfor-in,for-eachandfor-ofloops
e. Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not.[Eg:153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e.,13 + 53+ 33 = 153]
f. Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's. (Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1- 10's, 1-2's & 1-1's)

TASK–9	CO4

9. Java script Functions and Events

a. Design a appropriate function should be called to display
   - Factorial of that number
   - Fibonacci series upto that number
   - Prime numbers upto that number
   - Is it palindrome or not

b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
   1. Factorial of that number
   2. Fibonacci series upto that number
   3. Prime numbers upto that number
   4. Is it palindrome or not

c. Write a program to validate the following fields in a registration page
   i. Name(start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
   ii. Mobile(only numbers and length10 digits)
   iii. E-mail(should contain form at like xxxxxxx@xxxxxx.xxx)

Textbooks:

1. Programming the World Wide Web, 7thEdition, RobetWSebesta, Pearson,2013.
2. WebProgrammingwithHTML5,CSS and JavaScript, JohnDean, Jones&Bartlett Learning, 2019 (Chapters 1-11).
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.

Web Links:

1. https://www.w3schools.com/html
2. https://www.w3schools.com/css
3. https://www.w3schools.com/js/
4. https://www.w3schools.com/nodejs

https://www.w3schools.com/typescript

NARAYANA ENGINEERING COLLEGE :: GUDUR								
IV Sem	**DESIGN THINKING FOR INNOVATION**							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A99401	1	0	2	48	2	30	70	100

Course Objectives:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes: After successful completion of this course, the students should be able to:

CO 1	Define the concepts related to design thinking.**(BL1, BL2)**
CO 2	Explain the fundamentals of Design Thinking and innovation **(BL1, BL2)**
CO 3	Apply the design thinking techniques for solving problems in various sectors. **(BL3)**
CO 4	Analyse to work in a multi disciplinary environment **(BL4)**
CO 5	Evaluate the value of creativity **(BL5)**
CO 6	Formulate specific problem statements of real time issues **(BL3, BL6)**

COURSE CONTENT		
MODULE – 1	**Introduction to Design Thinking**	**9H**
Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.		
MODULE – 2	**Design Thinking Process**	**10H**
Design thinking process (empathize, analyze, idea &prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development **Activity:** Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.		
MODULE – 3	**Innovation**	**10H**
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity. **Activity:** Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.		
MODULE – 4	**Product Design**	**10H**
Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies **Activity:** Importance of modelling, how to set specifications, Explaining their own product design.		
MODULE – 5	**Design Thinking in Business Processes**	**9H**
Design Thinking applied in Business &Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs-DesignthinkingforStartups-DefiningandtestingBusinessModelsandBusinessCases- Developing & testing prototypes. **Activity:** How to market our own product, About maintenance, Reliability and plan for startup.		
	Total hours:	**48 hours**

Textbooks:

1. TimBrown, Change by design, Harper Bollins(2009)
2. IdrisMootee, Design Thinking for Strategic Innovation, 2013, John Wiley&Sons.

Reference Books:

1. DavidLee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell, Universal Principles of Design- Kritinaholden, JillButter. Chesbrough.H, The Era of OpenInnovation– 2013

Online Learning Resources:

https://nptel.ac.in/courses/110/106/110106124/

https://nptel.ac.in/courses/109/104/109104109/

III B.Tech I Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
V Sem	**ARTIFICIAL INTELLIGENCE**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	3	0	0	44	3	30	70	100

Pre-requisite:

- Knowledge in Computer Programming.
- A course on ―Mathematical Foundations of Computer Science‖.
- Background in linear algebra, data structures and algorithms, and probability.

Course Objectives:

- The student should be made to study the concepts of Artificial Intelligence.
- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The student should be made to introduce the concepts of Expert Systems.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.
- To learn different knowledge representation techniques

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

CO1	Apply searching techniques for solving a problem
CO2	Analyze and Design Intelligent Agents
CO3	Develop Natural Language Interface for Machines
CO4	Design mini robots
CO5	Summarize past, present and future of Artificial Intelligence.

COURSE CONTENT		
MODULE – 1	**Introduction**	**9H**
AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.		
MODULE – 2	**Solving Problems by searching**	**9H**
Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.		
MODULE – 3	**Representation of Knowledge**	**8H**
Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and dempstershafer theory.		
MODULE – 4	**Logic concepts**	**8H**
First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.		
MODULE – 5	**Expert Systems**	**10H**
Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.		
	Total hours:	**44 hours**

Textbooks:

1. S. Russel and P. Norvig, —Artificial Intelligence – A Modern Approach‖, Second Edition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., —Artificial Intelligence (SIE)‖, Mc Graw Hill

Reference Books:

1. David Poole, Alan Mack worth, Randy Goebel,‖ Computational Intelligence: a logical approach‖, Oxford University Press.
2. G. Luger, —Artificial Intelligence: Structures and Strategies for complex problemsolving‖, Fourth Edition, Pearson Education.
3. J. Nilsson, —Artificial Intelligence: A new Synthesis‖, Elsevier

Publishers.

4. Artificial Intelligence, SarojKaushik, CENGAGE Learning.

Online Learning Resources:

1. https://ai.google/
2. https://swayam.gov.in/nd1_noc19_me71/preview

III B.Tech I Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
V Sem	**COMPUTER NETWORKS & INTERNET PROTOCOLS**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	3	0	0	43	3	30	70	100

Course Objectives:

The course is designed to

- Understand the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP
- Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

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

CO1	Identify the software and hardware components of a computer network (BL1)
CO2	Explain the functionality of each layer of a computer network. (BL2)
CO3	Identify and analyze flow control, congestion control, and routing issues. (BL4)
CO4	Analyze and interpret the functionality and effectiveness of the routing protocols. (BL4)
CO5	Choose the appropriate transport protocol based on the application requirements (BL3)

COURSE CONTENT		
MODULE – 1	**Computer Networks and the Internet**	**8H**
What Is the Internet? Network Edge, The Network Core, Delay, Loss, and Throughput in Packet Switched Networks (Textbook 2), Reference Models, Multimedia Networks, Guided Transmission Media, Wireless Transmission (Textbook 1)		
MODULE – 2	**The Data Link Layer, Access Networks, and LANs**	**10H**
Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1) Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page (Packet) (Textbook 2)		
MODULE – 3	**The Network Layer**	**8H**
Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1)		
MODULE – 4	**The Transport Layer**	**9H**
Connectionless Transport: UDP (Textbook 2), The Internet Transport Protocols: TCP, Congestion Control (Textbook 1)		
MODULE – 5	**The Application Layer:**	**8H**
Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications, Video Streaming and Content Distribution Networks (Textbook 2)		
	Total hours:	**43 hours**

Textbooks:

1. Andrew S. Tanenbaum, David J. Wetherall, *Computer Networks*, 6th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, *Computer Networking: A Top-Down Approach*, 6th Edition, Pearson, 2019.

Reference Books:

1. Forouzan, *Data Communications and Networking*, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akhtar, *Networks for Computer Scientists and Engineers*, Oxford Publishers, 2016.

Online Learning Resources:

1. https://nptel.ac.in/courses/106105183/25

2. http://www.nptelvideos.in/2012/11/computer-networks.html 3. https://nptel.ac.in/courses/106105183/3

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III B.Tech I Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
V Sem	**AUTOMATA THEORY AND COMPILER DESIGN**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	3	0	0	60	3	30	70	100

Course Objectives:

- Able to understand the concept of abstract machines, construct FA, Regular Expressions for the regular languages and equivalent FSMs.
- Able to construct pushdown automata equivalent to Context free Grammars, construct Turing Machines and understand undecidability.
- Emphasize the concepts learnt in phases of compiler, lexical analyser and Top-down parser.
- Able to understand the concepts of Bottom-up parser, Intermediate Code Generation.
- Able to understand the concepts of Code optimizer and Code Generation.

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

CO1	Demonstrate knowledge on Automata Theory, Regular Expression and Analyze and Design of finite automata, and prove equivalence of various finite automata.
CO2	Demonstrate knowledge on context free grammar, Analyze and design of PDA and TM.
CO3	Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.
CO4	Ability to implement semantic rules into a parser that performs attribution while parsing and apply error detection and correction methods.
CO5	Apply the code optimization techniques to improve the space and time complexity of programs while programming and Ability to design a compiler.

COURSE CONTENT		
MODULE – 1	**Introduction to Automata and Regular Expressions**	**12H**
Introduction, Alphabets, Strings and Languages, Chomsky Hierarchy, Automata and Grammars, Regular Grammar and Language, Finite Automata, Deterministic finite Automata (DFA), Nondeterministic finite Automata (NFA), Equivalence of NFA and DFA, Minimization of Finite Automata, Regular Expressions, Converting Regular Grammar and Expression into Finite Automata, Pumping lemma for regular sets, Closure properties of regular sets (Without proof).		
MODULE – 2	**Context Free Grammars and Pushdown Automata**	**12H**
Context Free Language, Context Free Grammar, Derivation and Parse tree, Ambiguity, Simplification of CFG's, Chomsky Normal Form, Greibach Normal Form, Push Down Automat (PDA), Design of PDA, Equivalence of PDA and CFL/CFG		
MODULE – 3	**Turing Machines and Introduction to Compilers**	**12H**
Turing Machine, TM Model, Language acceptance, Design of Turing Machine, Compilers, Phases of Compiler, The role of Lexical Analyzer, Input Buffering.		
MODULE – 4	**Parsers and Intermediate Code Generation**	**12H**
Parser, Top-Down parsers: Recursive Descent Parsers, Predictive Parsers Bottom–up Parsers: Shift-Reduce Parsing, LR parsers, Intermediate Code Generation: Three address codes.		
MODULE – 5	**Code Optimization and Code Generation**	**12H**
Code Optimization: Peephole optimization, Basic blocks and flow graphs, DAG, Principles of Source Code Optimization, Code Generation: Issues in Design of Code Generation, Simple Code Generator.		
	Total hours:	**60 hours**

TEXT BOOKS:

1) Introduction to Automata theory languages and Computation, Hopcroft H.E. and Ullman Jeffrey.D, 3/e, 2006, Pearson Education, New Delhi, India.
2) Mishra K L P and Chandrasekaran N, "Theory of Computer Science - Automata, Languages and Computation", 2/e, 2007, PHI, New Delhi, India.
3) Compilers: Principles, Techniques, and Tools, Updated 2e July 2023 Alfred V. Aho , Monica S. Lam, Ravi Sethi , Jeffrey D. Ullman , Sorav Bansal

REFERENCES:

1. Introduction to Languages and Theory of Computation, John C Martin, 1/e, 2009, Tata McGraw Hill Education, Hyderabad, India.
2. Introduction to Theory of Computation, Sipser, 2/e, 2005, Thomson, Australia.
3. Compiler Construction: Principles And Practice, Kenneth C. Louden, Thomson/ Delmar Cengage Learning, 2006.

4. Lex &yacc, Doug Brown, John Levine and Tony Mason, 2 nd Edition, O'reilly Media
5. Engineering a compiler, Keith Cooper and Linda Torczon, 2 nd Edition, Morgan Kaufmann, 2011.

e-Resources:

1) https://nptel.ac.in/courses/106/104/106104028/
2) https://nptel.ac.in/courses/106/104/106104123/

III B.Tech I Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
V Sem	**INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	3	0	0	60	3	30	70	100

Course Objectives:

- Introduce fundamental quantum concepts like superposition and entanglement.
- Understand theoretical structure of qubits and quantum information.
- Explore conceptual challenges in building quantum computers.
- Explain principles of quantum communication and computing.
- Examine real-world applications and the future of quantum technologies.

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

CO1	Explain core quantum principles in a non-mathematical manner.
CO2	Compare classical and quantum information systems.
CO3	Identify theoretical issues in building quantum computers.
CO4	Discuss quantum communication and computing concepts.
CO5	Recognize applications, industry trends, and career paths in quantum technology.

COURSE CONTENT		
MODULE – 1	**Introduction to Quantum Theory and Technologies**	**12H**
The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India's Quantum Mission, EU, USA, China.		
MODULE – 2	**Theoretical Structure of Quantum Information Systems**	**12H**
What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non- engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract,The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role		
MODULE – 3	**Building a Quantum Computer – Theoretical Challenges and Requirements**	**12H**
What is required to build a quantum computer (conceptual overview)?,Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers: Why maintaining entanglement is difficult,Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Visionvs reality: what's working and what remains elusive,The role of quantum software in managing theoretical complexities		
MODULE – 4	**Quantum Communication and Computing – Theoretical Perspective**	**12H**
Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once),Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential		
MODULE – 5	**Applications, Use Cases, and the Quantum Future**	**12H**
Real-world application domains: Healthcare (drug discovery),Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum, Ethical, societal, and policy		

considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race	
Total hours:	**60 hours**

TEXT BOOKS:

1. Michael A. Nielsen, Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
3. Chris Bernhardt, *Quantum Computing for Everyone*, MIT Press, 2019.

REFERENCES:

1. David McMahon, *Quantum Computing Explained*, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, *An Introduction to Quantum Computing*, Oxford University Press, 2007.
3. Scott Aaronson, *Quantum Computing Since Democritus*, Cambridge University Press, 2013.
4. **Alastair I.M. Rae**, *Quantum Physics: A Beginner's Guide*, Oneworld Publications, Revised Edition, 2005.
5. **Eleanor G. Rieffel, Wolfgang H. Polak**, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
6. **Leonard Susskind, Art Friedman**, *Quantum Mechanics: The Theoretical Minimum*, Basic Books, 2014.
7. **Bruce Rosenblum, Fred Kuttner**, *Quantum Enigma: Physics Encounters Consciousness*, Oxford University Press, 2nd Edition, 2011.
8. **GiulianoBenenti, GiulioCasati, GiulianoStrini**, *Principles of Quantum Computation and Information, Volume I: Basic Concepts*, World Scientific Publishing, 2004.
9. **K.B. Whaley et al.**, *Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document*, Quantum Flagship, European Commission, 2020.
10. **Department of Science & Technology (DST), Government of India**, *National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers*, MeitY/DST Publications, 2020 onward.

f- Resources:

1) IBM Quantum Experience and Qiskit Tutorials
2) Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley

3) edX – The Quantum Internet and Quantum Computers
4) YouTube – Quantum Computing for the Determined by Michael Nielsen
5) Qiskit Textbook – IBM Quantum

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III B.Tech I Semester
PROFESSIONAL ELECTIVE-1

NARAYANA ENGINEERING COLLEGE :: GUDUR								
V Sem	**OBJECT ORIENTED ANALYSIS AND DESIGN**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A05503a	3	0	0	45	3	30	70	100

Course Objectives:

1. Describe the activities in the different phases of the object-oriented development lifecycle.
2. Understand the concepts of object-oriented model with the E-R and EER models.
3. Model a real-world application by using UML diagram.
4. Design architectural modelling.
5. Describing an application of UML.

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

CO1	The importance of modelling in UML.
CO2	Compare and contrast the object-oriented model with the E-R and EER models.
CO3	Design use case diagram. Design an application using deployment diagram.
CO4	Apply UML diagrams to build library application.

COURSE CONTENT		
MODULE – 1		**9H**
Introduction to UML: Importance of modelling, principles of modelling, object-oriented modelling, conceptual model of the UML, Architecture, Software Development Life Cycle.		
MODULE – 2		**9H**
Basic Structural Modelling: Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modelling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. Class & Object Diagrams: Terms, concepts, modelling techniques for Class & Object Diagrams.		
MODULE – 3		**9H**
Basic Behavioural Modelling-I: Interactions, Interaction diagrams. Basic Behavioural Modelling-II: Use cases, Use case Diagrams, Activity Diagrams.		
MODULE – 4		**9H**
Advanced Behavioral Modelling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modelling: Component, Deployment, Component diagrams and Deployment diagrams		
MODULE – 5		**9H**
Patterns and Frameworks, Artifact Diagrams. Case Study: The Unified Library application.		
	Total hours:	**45hours**

Text Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modelling Language User Guide, Pearson Education 2nd Edition.
2. Object-Oriented Analysis and Design with the Unified Process By John W. Satzinger, Robert B Jackson and Stephen D Burd, Cengage Learning.

Reference Books:

1. Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modelling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Mark Priestley: Practical Object-Oriented Design with UML, TMH.
5. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

III B.Tech I Semester
PROFESSIONAL ELECTIVE-1

NARAYANA ENGINEERING COLLEGE :: GUDUR								
V Sem	**SOFT COMPUTING**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A05503b	3	0	0	43	3	30	70	100

Course Objectives:

- Familiarize with soft computing concepts
- Introduce and use the idea of fuzzy logic and use of heuristics based on human experience
- Familiarize the Neuro-Fuzzy modelling using Classification and Clustering techniques
- Learn the concepts of Genetic algorithm and its applications
- Acquire the knowledge of Rough Sets.

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

CO1	Identify the difference between Conventional Artificial Intelligence to Computational Intelligence.
CO2	Understand fuzzy logic and reasoning to handle and solve engineering problems
CO3	Apply the Classification techniques on various applications
CO4	Perform various operations of genetic algorithms and Rough Sets

COURSE CONTENT		
MODULE – 1		**9H**
Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing, Applications of Soft Computing Techniques.		
MODULE – 2		**8H**
Fuzzy Systems: Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems		
MODULE – 3		**8H**
Fuzzy Decision Making, Particle Swarm Optimization.		
MODULE – 4		**9H**
Genetic Algorithms: Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm.		
MODULE – 5		**9H**
Rough Sets, Rough Sets, Rule Induction, and Discernibility Matrix, Integration of Soft Computing Techniques.		
	Total hours:	**43 hours**

Text Book:

1. Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy and J. Anuradha – Cengage Learning

Reference Books:

1. S. N. Sivanandam & S. N. Deepa, ―Principles of Soft Computing‖, 2nd edition, Wiley India, 2008.
2. David E. Goldberg, ―Genetic Algorithms-In Search, optimization and Machine learning‖, Pearson Education.
3. J. S. R. Jang, C.T. Sun and E.Mizutani, ―Neuro-Fuzzy and Soft Computing‖, Pearson Education, 2004.
4. G.J. Klir & B. Yuan, ―Fuzzy Sets & Fuzzy Logic‖, PHI, 1995.
5. Melanie Mitchell, ―An Introduction to Genetic Algorithm‖, PHI, 1998.
6. Timothy J. Ross, ―Fuzzy Logic with Engineering Applications‖, McGraw- Hill International editions, 1995.

III B.Tech I Semester
PROFESSIONAL ELECTIVE-1

NARAYANA ENGINEERING COLLEGE :: GUDUR								
V Sem	**MICROPROCESSORS AND MICROCONTROLLERS**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	3	0	0	42	3	30	70	100

Course Objectives:

1. To comprehend the architecture, operation, and configurations of the 8086 microprocessors.
2. To get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
3. To study the interfacing of 8086 with memory, peripherals, and controllers for various applications.
4. To learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. To understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

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

CO1	Gain knowledge on the architecture, operation, and configurations of the 8086 microprocessors.
CO2	Get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
CO3	Know the interfacing of 8086 with memory, peripherals, and controllers for various applications.
CO4	Learn the architecture, instruction set, and programming of the 8051 microcontrollers.
CO5	Understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

COURSE CONTENT		
MODULE – 1		**8H**
8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.		
MODULE – 2		**9H**
8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.		
MODULE – 3		**8H**
8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.		
MODULE – 4		**9H**
Microcontroller - Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.		
MODULE – 5		**8H**
Interfacing Microcontroller - Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors		
	Total hours:	**42hours**

Text books:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

References:

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and

Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004.

III B.Tech I Semester
PROFESSIONAL ELECTIVE-1

NARAYANA ENGINEERING COLLEGE :: GUDUR								
V Sem	**DATA WAREHOUSING & DATA MINING**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	3	0	0	43	3	30	70	100

Course Objective:

- Familiarize with mathematical foundations of data mining tools.
- Introduce classical models and algorithms in data warehouses and data mining.
- Investigate the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- Explore data mining techniques in various applications like social, scientific and environmental context.

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

CO1	Design a Data warehouse system and perform business analysis with OLAP tools
CO2	Apply suitable pre-processing and visualization techniques for data analysis
CO3	Apply frequent pattern and association rule mining techniques for data analysis
CO4	Design appropriate classification and clustering techniques for data analysis
CO5	Infer knowledge from raw data

COURSE CONTENT		
MODULE – 1		**9H**
Basic Concepts – Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors – Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies -Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP.		
MODULE – 2		**9H**
Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.		
MODULE – 3		**8H**
Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns.		
MODULE – 4		**9H**
Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection- Techniques to improve Classification Accuracy. Clustering Techniques – Cluster analysis-Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.		
MODULE – 5		**8H**
Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database – Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.		
	Total hours:	**43 hours**

Text Book:

1.Jiawei Han and Micheline Kamber, —Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.

References:

1.Alex Berson and Stephen J.Smith, —Data Warehousing, Data

Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.

2.K.P. Soman, Shyam Diwakar and V. Ajay, —Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.

3.Ian H.Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.

III B.Tech I Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
V Sem	**ARTIFICIAL INTELLIGENCE LAB**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	0	0	3	36	1.5	30	70	100

Pre-requisite:

- Knowledge in Computer Programming.
- Background in linear algebra, data structures and algorithms, and probability

Course Objectives:

- The student should be made to study the concepts of Artificial Intelligence.
- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The student should be made to introduce the concepts of Expert Systems and machine learning.

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

CO1	Understand the Mathematical and statistical prospectives of machine learning algorithms through python programming
CO2	Appreciate the importance of visualization in the data analytics solution.
CO3	Derive insights using Machine learning algorithms
CO4	Implement and demonstrate AI and ML algorithms.
CO5	Evaluate different algorithms.

COURSE CONTENT	
List of Experiments	
TASK–1	**CO1**
Write a Program to Implement Breadth First Search using Python.	
TASK–2	**CO1**
Write a program to implement Best First Searching Algorithm	
TASK–3	**CO1**
Write a Program to Implement Depth First Search using Python.	
TASK–4	**CO2**
Write a program to implement the Heuristic Search	
TASK–5	**CO2**
Write a python program to implement A* and AO* algorithm. (Ex: find the shortest path)	
TASK–6	**CO2**
Write a Program to Implement Water-Jug problem using Python.	
TASK–7	**CO1**
Write a Program to Implement Alpha-Beta Pruning using Python.	
TASK–8	**CO1**
Write a Program to implement 8-Queens Problem using Python.	
TASK–9	**CO3**
Write a program to schedule a meeting among a 5 busy people using Default Reasoning the output should give the time, place and day of the meeting.	
TASK–10	**CO3**
Write a program to implement the Unification algorithm	
TASK–11	**CO3**
Develop a knowledge base system consisting of facts and rules about some specialized knowledge domain	
TASK–12	**CO2**
Write a program to implement 8 puzzle programs using different heuristics. Using it play the game Tic-Tac-Toe at the end the game the program should display the no. of nodes generated, cutoff values at each stage in the form of a table.	
Total hours:	**36 hours**

Textbooks:

1. PrateekJoshi,Artificial Intelligence with Python,Packt Publishing, 2017.
2. Xiao, Perry. Artificial intelligence programming with Python: from zero to hero. John Wiley & Sons, 2022

References:

1. Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach, Fourth Edition, Pearson, 2020
2. Martin C. Brown (Author), —Python: The Complete Reference‖ McGraw Hill Education, Fourth edition, 2018
3. R. NageswaraRao , —Core Python Programming‖ Dreamtech Press India Pvt Ltd 2018.
1.

Online Learning Resources/Virtual Labs:

1. https://onlinecourses.nptel.ac.in/noc19_cs40/preview
2. https://onlinecourses.nptel.ac.in/noc19_cs41/preview

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III B.Tech I Semester

<table>
<tr><td colspan="8">NARAYANA ENGINEERING COLLEGE :: GUDUR</td></tr>
<tr><td>V Sem</td><td colspan="6">COMPUTER NETWORKS & INTERNET PROTOCOLS LAB</td><td>R23</td></tr>
<tr><td rowspan="2">Course Code</td><td colspan="3">Hours / Week</td><td rowspan="2">Total hrs</td><td>Credit</td><td colspan="3">Max Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>TOTAL</td></tr>
<tr><td></td><td>0</td><td>0</td><td>3</td><td>36</td><td>1.5</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="8">Course Objectives:
• To understand the different types of networks
• To discuss the software and hardware components of a network
• To enlighten the working of networking commands supported by operating system
• To impart knowledge of Network simulator 2/3
• To familiarize the use of networking functionality supported by JAVA
• To familiarize with computer networking tools.</td></tr>
<tr><td colspan="8">Course Outcomes: After completion of the course, students will be able to</td></tr>
<tr><td>CO1</td><td colspan="7">To understand the working principle of various communication protocols.</td></tr>
<tr><td>CO2</td><td colspan="7">To understand the network simulator environment and visualize a network topology and observe its performance.</td></tr>
<tr><td>CO3</td><td colspan="7">To analyze the traffic flow and the contents of protocol frames.</td></tr>
<tr><td>CO4</td><td colspan="7">Critique the existing routing protocols</td></tr>
</table>

COURSE CONTENT
List of Experiments
TASK–1
Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
TASK–2
Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
TASK–3
Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
TASK–4
1. Implement Dijkastra's algorithm to compute the shortest path through a network
TASK–5
1. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
TASK–6
1. Implement distance vector routing algorithm for obtaining routing tables at each node.
TASK–7
1. Implement data encryption and data decryption
TASK–8
1. Write a program for congestion control using Leaky bucket algorithm.
TASK–9
1. Write a program for frame sorting technique used in buffers.
TASK–10
1. Programs using Wireshark i. Packet Capture Using Wire shark ii. Starting Wire shark iii. Viewing Captured Traffic iv. Analysis and Statistics & Filters. 2. How to run Nmap scan
TASK–11
1. Operating System Detection using Nmap
TASK–12
1. Do the following using NS2 Simulator

i. NS2 Simulator-Introduction ii. Simulate to Find the Number of Packets Dropped iii. Simulate to Find the Number of Packets Dropped by TCP/UDP iv. Simulate to Find the Number of Packets Dropped due to Congestion v.Simulate to Compare Data Rate& Throughput. vi. Simulate to Plot Congestion for Different Source/Destination vii. Simulate to Determine the Performance with respect to transmission of Packets	
Total hours:	**36 hours**

Text Books:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 6th Edition, PEARSON.
2. James F.Kurose, Keith W. Ross, Computer Networking: A Top-Down 6th edition, Pearson, 2019.
3. 3. Computer Networks: A Systems Approach-Bruce Davie, VMware-Larry Peterson, Princeton University-2019.

Reference Books:

1. Computer Networks–B. K. MathanNagan, T. Mahalakshmi-Charulatha Publications PrivateLimited-2019.
2. Computer Networks-Dr.Amol V. Dhumane Nitin N. Sakhare-NiraliPrakashan Publishers-2024
3. Data Communications and Networking with TCPIP Protocol Suite-Behrouz A. Forouzan- McGraw Hill-6th Edition

Online Learning Resources/Virtual Labs:

- https://www.netacad.com/courses/packet-tracer- Cisco Packet Tracer.
- Ns Manual, Available at: https://www.isi.edu/nsnam/ns/ns-documentation.html, 2011.
- https://www.wireshark.org/docs/wsug_html_chunked/-Wireshark.
- https://nptel.ac.in/courses/106105183/25
- http://www.nptelvideos.in/2012/11/computer-networks.html
- https://nptel.ac.in/courses/106105183/3
- http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php

III B.Tech I Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
V Sem	**FULL STACK DEVELOPMENT – II (Skill Enhancement Course)**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A05505	0	1	2	36	2	30	70	100

Course Objectives: The main objectives of the course are to

- Make use of Modern- day JavaScript with ES6 standards for designing Dynamic web pages
- Building robust & responsive User Interfaces using popular JavaScript library '**React.js**'. Building robust backend APIs using '**Express. js**'
- Establishing the connection between frontend (React) User interfaces and backend APIs (Express) with Data Bases(My SQL)
- Familiarize students with GitHub for remote repository hosting and collaborative development.

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

CO1	Building fast and interactive UIs
CO2	Applying Declarative approach for developing web apps
CO3	Understanding ES6 features to embrace modern JavaScript
CO4	Building reliable APIs with Express. Js
CO5	Create and manage Git repositories, track changes, and push code to GitHub.

Experiments covering the Topics:

- Introduction to DOM (Document Object Model), Ecma Script (ES6) standards and features like Arrow functions, Spread operator, Rest operator, Type coercion, Type hoisting, String literals, Array and Object Destructuring.
- Basics of React. js like React Components, JSX, Conditional rendering Differences between Real DOM and Virtual DOM.
- Important React.js concepts like React hooks, Props, React forms, Fetch

API, Iterative rendering using JavaScript map function.

- JavaScript runtime environment node.js and its uses, Express. js and Routing, Micro-Services architecture and MVC architecture, database connectivity using (My SQL)
- Introduction to My SQL, setting up MySQL and configuring, Databases, My SQL queries, subqueries, creating My SQL driver for database connectivity to Express. js server.

COURSE CONTENT

List of Experiments

TASK–1

Introduction to Modern JavaScript and DOM

a. Write a JavaScript program to link JavaScript file with the HTML page

b. Write a JavaScript program to select the elements in HTML page using selectors

c. Write a JavaScript program to implement the event listeners

d. Write a JavaScript program to handle the click events for the HTML button elements

e. Write a JavaScript program to With three types of functions

   i. Function declaration

   ii. Function definition

   iii. Arrow functions

TASK–2

Basics of React. Js

a. Write a React program to implement a counter button using react class components

b. Write a React program to implement a counter button using react functional components

c. Write a React program to handle the button click events in functional component

d. Write a React program to conditionally render a component in the browser

e. Write a React program to display text using String literals

TASK–3

Important concepts of React. js

a. Write a React program to implement a counter button using React use State hook

b. Write a React program to fetch the data from an API using React use Effect hook

c. Write a React program with two react components sharing data using Props.

d. Write a React program to implement the forms in react

e. Write a React program to implement the iterative rendering using map function.

TASK–4

Introduction to Git and GitHub

a. **Setup**
   - Install Git on local machine.
   - Configure Git (user name, email).
   - Create GitHub account and generate a personal access token.

b. **Basic Git Workflow**
   - Create a local repository using git init
   - Create and add files →git add .
   - Commit files →git commit -m "Initial commit"
   - Connect to GitHub remote →git remote add origin <repo_url>
   - Push to GitHub →git push -u origin main

c. **Branching and Collaboration**
   - Create a branch →git checkout -b feature1
   - Merge branch to main →git merge feature1
   - Resolve merge conflicts (guided)

TASK–5

Upload React Project to GitHub

a. Create a new React app using npx create-react-app myapp
b. Initialize a git repo and push to GitHub
c. Use .gitignore to exclude node_modules
d. Create multiple branches: feature/navbar, feature/form
e. Practice merge and pull requests (can use GitHub GUI)

TASK–6

Introduction to Node. js and Express. js

a. Write a program to implement the ‗hello world' message in the route through the browser using Express
b. Write a program to develop a small website with multiple routes using Express. js
c. Write a program to print the ‗hello world' in the browser console using Express. js
d. Write a program to implement the CRUD operations using Express. js
e. Write a program to establish the connection between API and Database using Express – My SQL driver

Introduction to My SQL

f. Write a program to create a Database and table inside that database using My SQL Command line client

g. Write a My SQL queries to create table, and insert the data, update the data in the table h. Write a My SQL queries to implement the subqueries in the My SQL command line client i. Write a My SQL program to create the script files in the My SQL workbench j. Write a My SQL program to create a database directory in Project and initialize a database. sql file to integrate the database into API	
Total hours:	**36hours**

Textbooks:

1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett Professional JavaScript for Web Developers Book by Nicholas C. Zakas
2. John Dean, Web Programming with HTML5, CSS and JavaScript, Jones & Bartlett Learning, 2019.
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.
4. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites by Robin Nixon
5. AZAT MARDAN, Full Stack Java Script: Learn Back bone. js, Node.jsand Mongo DB.2015

Reference Books:

1. Full-Stack JavaScript Development by Eric Bush.
2. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
3. Tomasz Dyl , Kamil Przeorski , Maciej Czarnecki, Mastering Full Stack React Web Development 2017.

Online Learning Resources:

1. https://ict.iitk.ac.in/product/full-stack-developer-html5-css3-js-bootstrap-php-4/
2. https://www.w3schools.com/html
3. https://www.w3schools.com/css
4. https://www.w3schools.com/js/
5. https://www.w3schools.com/nodejs
6. https://www.w3schools.com/typescript

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III B.Tech I Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
V Sem	**TINKERING LAB**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	0	0	2	36	1	30	70	100

The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge.

Course objectives: The objectives of the course are to

- Encourage Innovation and Creativity
- Provide Hands-on Learning and Impart Skill Development
- Foster Collaboration and Teamwork
- Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship.
- Impart Problem-Solving mind-set.

These labs bridge the gap between academia and industry, providing students with the practical experience. Some students may also develop entrepreneurial skills, potentially leading to start- ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

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

CO1	Design, build, and test basic prototypes using sensors, microcontrollers, and electronic components.
CO2	Apply design thinking processes to real-world problems.
CO3	Collaborate effectively in teams to ideate and implement innovative solutions.
CO4	Use tools like Arduino, ESP32, and 3D printers for hands-on implementation.
CO5	Demonstrate practical understanding of IoT, automation, and control systems.

COURSE CONTENT	
List of Experiments	
TASK–1	
Make your own parallel and series circuits using breadboard for any application of your choice.	
TASK–2	
Design and 3D print a Walking Robot	
TASK–3	
Design and 3D Print a Rocket.	
TASK–4	
Temperature & Humidity Monitoring System (DHT11 + LCD)	
TASK–5	
Water Level Detection and Alert System	
TASK–6	
Automatic Plant Watering System	
TASK–7	
Bluetooth-Based Door Lock System	
TASK–8	
Smart Dustbin Using Ultrasonic Sensor	
TASK–9	
Fire Detection and Alarm System	
TASK–10	
RFID-Based Attendance System	
TASK–11	
Voice-Controlled Devices via Google Assistant	
TASK–12	
Heart Rate Monitoring Using Pulse Sensor	
TASK–13	
Soil Moisture-Based Irrigation	
TASK–14	
Smart Helmet for Accident Detection	
TASK–15	
Milk Adulteration Detection System	
TASK–16	
Water Purification via Activated Carbon	
TASK–17	
Solar Dehydrator for Food Drying	

TASK–18	
Temperature-Controlled Chemical Reactor	
TASK–19	
Ethanol Mini-Plant Using Biomass	
TASK–20	
Smart Fluid Flow Control (Solenoid + pH Sensor)	
TASK–21	
Portable Water Quality Tester	
TASK–22	
AI Crop Disease Detection	
TASK–23	
AI-based Smart Irrigation	
TASK–24	
ECG Signal Acquisition and Plotting	
TASK–25	
AI-Powered Traffic Flow Prediction	
TASK–26	
Smart Grid Simulation with Load Monitoring	
TASK–27	
Smart Campus Indoor Navigator	
TASK–28	
Weather Station Prototype	
TASK–29	
Firefighting Robot with Sensor Guidance	
TASK–30	
Facial Recognition Dustbin	
TASK–31	
Barcode-Based Lab Inventory System	
TASK–32	
Growth Chamber for Plants	
TASK–33	
Biomedical Waste Alert System	
TASK–34	
Soil Classification with AI	
TASK–35	
Smart Railway Gate	
TASK–36	
Smart Bin Locator via GPS and Load Sensors	
TASK–37	
Algae-Based Water Purifier	

TASK–38	
Contactless Attendance via Face Recognition	
Total Hours	**36Hrs**

- **Note:** The students can also design and implement their own ideas, apart from the list of experiments mentioned above.
- **Note:** A minimum of 8 to 10 experiments must be completed by the students.

Reference

1) https://aim.gov.in/pdf/equipment-manual-pdf.pdf
2) https://atl.aim.gov.in/ATL-Equipment-Manual/
3) https://aim.gov.in/pdf/Level-1.pdf
4) https://aim.gov.in/pdf/Level-2.pdf
5) https://aim.gov.in/pdf/Level-3.pdf

III B.Tech II Semester

<table>
<tr><td colspan="8">NARAYANA ENGINEERING COLLEGE :: GUDUR</td></tr>
<tr><td>VI Sem</td><td colspan="6">MACHINE LEARNING</td><td>R23</td></tr>
<tr><td rowspan="2">Course Code</td><td colspan="3">Hours / Week</td><td rowspan="2">Total hrs</td><td>Credit</td><td colspan="2">Max Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>TOTAL</td></tr>
<tr><td></td><td>3</td><td>0</td><td>0</td><td>43</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="8">Course Objectives: The objectives of the course are
• Define machine learning and its different types (supervised and unsupervised) and understand their applications.
• Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).
• Implement unsupervised learning techniques, such as K-means clustering.</td></tr>
<tr><td colspan="8">Course Outcomes: After completion of the course, students will be able to</td></tr>
<tr><td>CO1</td><td colspan="7">Identify machine learning techniques suitable for a given</td></tr>
<tr><td>CO2</td><td colspan="7">Solve real-world problems using various machine learning techniques.</td></tr>
<tr><td>CO3</td><td colspan="7">Apply Dimensionality reduction techniques for data preprocessing.</td></tr>
<tr><td>CO4</td><td colspan="7">Explain what is learning and why it is essential in the design of intelligent machines</td></tr>
<tr><td>CO5</td><td colspan="7">Evaluate Advanced learning models for language, vision, speech, decision making etc.</td></tr>
</table>

COURSE CONTENT		
MODULE – 1	**Introduction to Machine Learning**	**8H**
Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.		
MODULE – 2	**Nearest Neighbor-Based Models**	**8H**
Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.		
MODULE – 3	**Models Based on Decision Trees**	**9H**
Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression. The Bayes Classifier: Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)		
MODULE – 4	**Linear Discriminants for Machine Learning**	**9H**
Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.		
MODULE – 5	**Clustering**	**9H**
Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.		
	Total hours:	**43 hours**

Textbooks:

1. Machine Learning Theory and Practice‖, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

Reference Books:

1. Machine Learning‖, Tom M. Mitchell, McGraw-Hill Publication, 2017
2. Machine Learning in Action‖,Peter Harrington, DreamTech
3. Introduction to Data Mining‖, Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

Online Learning Resources:

1. Coursera – Machine Learning by Andrew Ng (Stanford University)
2. Scikit-learn Documentation
3. Kaggle Learn – Machine Learning
4. Google's Machine Learning Crash Course
5. YouTube – StatQuest with Josh Starmer

III B.Tech II Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VI Sem	**CLOUD COMPUTING**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	3	0	0	42	3	30	70	100

Course Objectives:

- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security as pects in cloud.

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

CO1	Ability to create cloud computing environment
CO2	Ability to design applications for Cloud environment
CO3	Design & develop back up strategies for cloud data based on features.
CO4	Use and Examine different cloud computing services.
CO5	Apply different cloud programming model as per need.

COURSE CONTENT		
MODULE – 1	**Basics of Cloud computing**	**8H**

Introduction to cloud computing: Introduction, Character is tics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications

Cloud concepts and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

Cloud Services and Plat forms: Compute Services, Storage Services, Data, base Services, Application services, Content delivery services Analytics Services, Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software.

MODULE – 2	**Hadoop and Python**	**9H**

Hadoop Map Reduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Clusterset up.

Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Python Basics: Introduction, Installing Python, Python data Types & Data structures, Controlflow, Function, Modules, Packages, Filehandling, Date/Time Operations, Classes.

MODULE – 3	**Python for Cloud computing**	**8H**

Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for Map Reduce, Python packages of Interest, Python web Application Frame work, Designing a REST ful web API.

Cloud Application Developmentin Python: Design Approaches, Image Processing APP, Document Storage App, Map Reduce App, Social Media Analytics App.

MODULE – 4	**Big data, multimedia and Tuning**	**8H**

Big Data Analytics: Introduction, Clustering Big Data, Classification of Big data Recommendation of Systems.

Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Trans coding App.

Cloud Application Bench marking and Tuning: Introduction, Work load Character is tics, Application Performance Metrics, Design Considerations for a Bench marking Methodology, Bench marking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop bench marking case Study.

MODULE – 5	Applications and Issues in Cloud	9H

Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing.

Cloud for Industry, Health care & Education: Cloud Computing for Health care, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

Migrating in to a Cloud: Introduction, Broad Approaches to migrating into the cloud, the seven– step model of migration in to a cloud.

Organizational readiness and Change Management in The Cloud Age: Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self– assessment.

Legal Issues in Cloud Computing: Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issues raised by virtualization and at a location, commercial and business considerations, Special Topics.

Total hours:	**42 hours**

Text books:

1. Cloud computing Ahands - on Approach ‖By Arshdeep Bahga, Vijay Madisetti, Universities Press, 2016
2. Cloud Computing Principles and Paradigms: By RajKumar Buyya, James Broberg, Andrzej Goscinski, Wiley, 2016

Reference Books:

1. Masterin g Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, TMH
2. Cloud computing AHands-On Approach by Arshdeep Bahga and Vijay Madisetti.
3. Cloud Computing: A Practical Approach, Anthony T.Velte, To by J.Velte, Robert Elsenpeter, Tata Mc Graw Hill, rp 2011.
4. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese,O_Reilly, SPD, rp 2011.
6. Essentials of Cloud Computing by K.Chandrasekaran. CRC Press.

Online Learning Resources:

Cloud computing – Course (nptel.ac.in)

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III B.Tech II Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VI Sem	**CRYPTOGRAPHY & NETWORK SECURITY**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A05601T	3	0	0	44	3	30	70	100

Course Objectives:

This course aim sat training students to master the:

- The concepts of classical encryption techniques and concepts of finite fields and number theory
- Working principles and utilities of various crypto graphic algorithms including secret key crypto graphy, hashes, and message digests, and public key algorithms
- Design issues and working principles of various authentication protocols, PKI standards
- Various secure communication standards including Kerberos, I Psec, TLS and email
- Concepts of crypto graphic utilities and authentication mechanisms to design secure applications

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

CO1	Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts off in it fields and number theory.
CO2	Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication. **(,)**
CO3	Apply the knowledge of crypto graphic check sums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes. **(,)**
CO4	Demonstrate the ability to apply user authentication principles including Kerberos for secure authentication.
CO5	Gain proficiency in securing web communications using TLS and HTTPS, manage secure remote access with SSH, and design firewall policies

COURSE CONTENT		
MODULE – 1	**Introduction**	**9H**
Computer and Network Security Concepts: Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Classical Encryption Techniques: Sym metric Cip her Model, Substitution Techniques, Transposition Techniques, Steganography, Block Ciphers: Traditional Block Cipher Structure, The Data Encryption Standard, Advanced Encryption Standard: AES Structure, AES Transformation Functions.		
MODULE – 2	**Number Theory & Public Key Cryptography**	**9H**
The Euclidean Algorithm, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem, Discrete Logarithms, Finite Fields: Finite Fields of the Form GF(p), Finite Fields of the Form GF(2^n) .**Public Key Cryptography**: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.		
MODULE – 3	**Cryptographic Hash Functions**	**9H**
Cryptographic Hash Functions: Application of Cryp to graphic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC &CMAC. **Digital Signatures**: NIST Digital Signature Algorithm, Distribution of Public Keys, X.509 Certificates, Public- Key Infrastructure.		
MODULE – 4	**User Authentication**	**9H**
User Authentication: Remote User Authentication Principles, Kerberos. Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME. IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.		
MODULE – 5	**Transport Level Security & Fire walls**	**8H**
Transport Level Security: Web Security Requirements, Transport Layer Security (TLS), HTTPS, Secure Shell (SSH) **Fire walls:** Fire wall Character is tics and Access Policy, Types of Fire walls, Fire wall Location and Configurations.		
	Total hours:	**44 hours**

Text books:

1) Cryptography and Network Security – William Stallings, Pearson Education, 8th Edition.
2) Cryptography, Network Security and Cyber Laws–Bernard Menezes, Cengage Learning, 2010 edition.

Reference Books:

1) Cryptography and Network Security-BehrouzA Forouzan, Debdeep

Mukhopadhyaya, Mc- Graw Hill, 3rd Edition, 2015.

2) Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

Online Learning Resources:

1) https://nptel.ac.in/courses/106/105/106105031/lecture
2) https://nptel.ac.in/courses/106/105/106105162/lecture by Dr.Sourav Mukhopadhyay IIT Kharagpur[Video Lecture]
3) https://www.mitel.com/articles/web-communication-cryptography-and-network- security web articles by Mitel Power Connections

III B.Tech II Semester
PROFESSIONAL ELECTIVE- II

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VI Sem	**SOFTWARE TESTING METHODOLOGIES**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A05602a	3	0	0	43	3	30	70	100

Course Objectives:

- To study the fundamental concepts of software testing which includes objectives, process, criteria, strategies, and methods.
- To discuss various software testing types and levels of testing like black and white box testing along with levels unit test, integration, regression, and system testing.
- It also helps to learn the types of bugs, testing levels with which the student can very well identify a bug and correct as when it happens.
- It provides knowledge on transaction flow testing and data flow testing techniques so that the flow of the program is tested as well.
- To learn the domain testing, path testing and logic based testing to explore the testing process easier.

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

CO1	Know the basic concepts of software testing and its essentials.
CO2	Able to identify the various bugs and correcting them after knowing the consequences of the bug.
CO3	Use of program‘s control flow as a structural model is the corner stone of testing.
CO4	Performing functional testing using control flow and transaction flow graphs.

COURSE CONTENT		
MODULE – 1		**9H**
Introduction:-Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs, Flow graphs and Path testing:- Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.		
MODULE – 2		**8H**
Transaction Flow Testing:-transaction flows, transaction flow testing techniques. Dataflow testing:- Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.		
MODULE – 3		**8H**
Domain Testing:-domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.		
MODULE – 4		**9H**
Paths, Path products and Regular expressions:- path products &path expression, reduction procedure, applications, regular expressions & flow anomaly detection. Logic Based Testing:-over view, decision tables, path expressions, kv charts, specifications.		
MODULE – 5		**9H**
State, State Graphs and Transition testing:- state graphs, good & bad state graphs, state testing, Testability tips. Graph Matrices and Application:-Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools		
	Total hours:	**43 hours**

Text Books

1. Software Testing techniques – Boris Beizer, Dreamtech, second edition. Software Testing Tools – Dr. K.V.K.K. Prasad, Dreamtech

References Books:

1. The craft of software testing – Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

III B.Tech II Semester
PROFESSIONAL ELECTIVE- II

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VI Sem	**CYBER SECURITY**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A38503a	3	0	0	42	3	30	70	100

Course Objectives:

The course is designed to provide awareness on different cyber crimes, cyber offenses, tools and methods used in cybercrime.

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

CO1	Classify the cybercrimes and understand the Indian ITA 2000
CO2	Analyse the vulnerabilities in any computing system and find the solutions
CO3	Predict the security threats of the future
CO4	Investigate the protection mechanisms
CO5	Design security solutions for organizations

COURSE CONTENT		
MODULE – 1	**Introduction to Cybercrime**	**8H**
Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.		
MODULE – 2	**Cyber Offenses: How Criminals Plan Them**	**9H**
Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing		
MODULE – 3	**Cybercrime: Mobile and Wireless Devices**	**9H**
Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.		
MODULE – 4	**Tools and Methods Used in Cybercrime**	**8H**
Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares,Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.		
MODULE – 5	**Cyber Security: Organizational Implications**	**8H**
Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.		
	Total hours:	**42 hours**

Text books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

Reference Books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson,

CRC Press.

2. Introduction to Cyber Security, Chwan- Hwa(john) Wu,J. David Irwin.CRC Press T&F Group

Online Learning Resources:

1. http://nptel.ac.in/courses/106105031/40
2. http://nptel.ac.in/courses/106105031/39
3. http://nptel.ac.in/courses/106105031/38

III B.Tech II Semester
PROFESSIONAL ELECTIVE- II

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VI Sem	**DevOps**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A05602b	3	0	0	45	3	30	70	100

Pre-requisite:
Fundamentals of software development and maintenance

Course Objectives:
- Understand collaboration and productivity by automating infrastructure and workflows
- Familiarize with continuous measuring applications performance

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

CO1	Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT serviceability
CO2	Describe Dev Ops &Dev Sec Ops methodologies and their key concepts
CO3	Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
CO4	Set up complete private infrastructure using version control systems and CI/CD tools

COURSE CONTENT		
MODULE – 1		**8H**
Dev Ops: An Overview, Dev Ops: Origins, Dev Ops: Roots, Dev Ops: Practices Dev Ops: Culture. **Adopting Dev Ops:** Developing the Playbook. Developing a Business Case for a Dev Ops: Developing the Business Case		
MODULE – 2		**9H**
Completing the Business Model Canvas, Customer Segments, Value Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, Cost Structures. Dev Ops Plays for Optimizing the delivery Pipeline: Dev Ops as an optimization Exercise, Core Themes, The Dev Ops Plays, Specializing Core Plays		
MODULE – 3		**8H**
Dev Ops Plays for Driving Innovation: Optimize to Innovate, The Uber Syndrome, Innovation and the Role of Technology, Core Themes, play: Build a Dev Ops Platform, play: Deliver Micro services Architectures, play: DevOps an API Economy, play: Organizing for Innovation.		
MODULE – 4		**10H**
Scaling Dev Ops for the Enterprise: Core Themes, play: Dev Ops Center of Competency, play: Developing Culture of Innovation at Scale, play: Developing a Culture of continuous Improvement, play: Team Models for Dev Ops, play: Standardization of Tools and Process, play: Security Considerations for Dev Ops, Play: Dev Ops and Outsourcing.		
MODULE – 5		**10H**
Leading Dev Ops Adoption in the Enterprise: Play: Dev Ops as a transformation Exercise, play: Developing a Culture of Collaboration and Trust, play: Dev Ops Thinking for the Line of Business, play: starting with Pilot Projects, Play: Rearing Unicorns on an Aircrafts Carrier. Appendix Case Study: Example Dev Ops Adoption Roadmap Organization Background, Roadmap Structure, Adoption Roadmap.		
	Total hours:	**45 hours**

Text books:

1. Sanjeev Sharma, The Dev Ops Adoption Playbook, Published by John Wiley & Sons, Inc.2017

Reference Books:

1. Sanjeev Sharma & Bernie Coyne, Dev Ops for Dummies, Published by John Wiley & Sons, Inc.
2. Michael Huttermann, Dev Ops for Developers, Apress publishers,2012.

Online Learning Resources:

Learning Dev Ops with Terra form Infrastructure Automation Course | Udemy

III B.Tech II Semester
PROFESSIONAL ELECTIVE- II

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VI Sem	**EMBEDDED SYSTEM DESIGN**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A05602c	3	0	0	43	3	30	70	100

Course Objectives:

1. To understand the history, classification, and design process of embedded systems.
2. To explore the core components of embedded systems, including processors, memory, and I/O components.
3. To introduce onboard and external communication interfaces used in embedded systems.
4. To explain different firmware design approaches and programming techniques for embedded systems.
5. To provide an understanding of real-time operating systems and task management in embedded systems.

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

CO1	Classify embedded systems based on their purpose, generation, and complexity.
CO2	Identify and select appropriate hardware components for an embedded system design.
CO3	Differentiate and implement various communication protocols like I2C, SPI, and CAN.
CO4	Develop firmware using assembly and high-level programming languages.
CO5	Analyze and apply RTOS-based task scheduling and synchronization techniques.

COURSE CONTENT		
MODULE – 1	**Introduction to Embedded Systems**	**9H**
History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded systems, The embedded system design process-requirements, specification, architecture design, designing hardware and software, components, system integration, Applications of embedded systems, and characteristics of embedded systems.		
MODULE – 2	**Typical Embedded System**	**9H**
Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, Sensors, actuators, I/O components: seven segment LED, relay, piezo buzzer, push button switch, other sub-systems: reset circuit, brownout protection circuit, oscillator circuit real time clock, watch dog timer.		
MODULE – 3	**Communication Interface**	**8H**
Onboard communication interfaces-I2C, SPI, CAN, parallel interface; External communication interfaces-RS232 and RS485, USB, infrared, Bluetooth, Wi-Fi, ZigBe, GPRS, GSM.		
MODULE – 4	**Embedded Firmware Design and Development**	**8H**
Embedded firmware design approaches-super loop based approach, operating system based approach; embedded firmware development languages-assembly language based development, high level language based development.		
MODULE – 5	**RTOS based Embedded System Design**	**9H**
Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling: non-pre-emptive and pre-emptive scheduling; task communication- shared memory, message passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization Issues, Task Synchronization Techniques.		
	Total hours:	**43 hours**

Text books:

1. Introduction to Embedded Systems - Shibu KV, Mc Graw Hill Education.
2. Computers as Components –Wayne Wolf, Morgan Kaufmann (second edition).

References:

1. Embedded System Design -Frank Vahid, Tony Grivargis, john Wiley.
2. Embedded Systems- An integrated approach - Lyla b das, Pearson education 2012.
3. Embedded Systems – Raj Kamal, TMH

III B.Tech II Semester
PROFESSIONAL ELECTIVE- III

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VI Sem	**SOFTWARE PROJECT MANAGEMENT**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	3	0	0	45	3	30	70	100

Course Objective:

This course is designed to enable the students to understand the fundamental principles of Software Project management & will also have a good knowledge of the responsibilities of a project manager and how to handle them.

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

CO1	Describe the fundamentals of Project Management
CO2	Recognize and use Project Scheduling Techniques
CO3	Familiarize with Project Control Mechanisms
CO4	Understand Team Management
CO5	Recognize the importance of Project Documentation and Evaluation

COURSE CONTENT		
MODULE – 1		**9H**
Conventional Software Management: The water fall model, conventional software Management performance Evolution of Software Economics: software Economics. Pragmatic Software Cost Estimation Improving Software Economics: Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality ,Peer Inspections.		
MODULE – 2		**9H**
The old way and the new: The principles of convention al software Engineering, principles of modern software management, transitioning to aniter ative process. Lifecycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts		
MODULE – 3		**9H**
Work Flows of the process: Software process work flows, Inter Trans work flows.Check points of the Process: Major Mile Stones, Minor Milestones, Periodic status assessments. Iterative Process Planning: work break down structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning		
MODULE – 4		**9H**
Process Automation: Automation Building Blocks, The Project Environment. Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators Tailoring the Process: Process discriminants. Managing people and organizing teams.		
MODULE – 5		**9H**
Project Organizations and Responsibilities: Line - of-Business Organizations, Project Organizations, evolution of Organizations. Future Software Project Management: modern Project Profiles, Next generation Software economics, modern process stransitions. Case Study: The Command Center Processing and Display System-Replacement(CCPDS-R)		
	Total hours:	**45 hours**

Text books:

1. Software Project Management, Walker Royce,Pearson Education,2012
2. BobHughes,MikeCotterellandRajibMall—SoftwareProjectManagement‖,6thEdition, Mc Graw Hill Edition, 2017

Reference Books:

1. PankajJalote,—SoftwareProjectManagementinpractice‖,5thEdition,PearsonEducation, 2017.

2. Murali K.Chemuturi,Thomas M.Cagley Jr.‖Mastering Software Project Management: Best Practices, Tools and Techniques‖, J.Ross Publishing, 2010
3. SanjayMohapatra,—SoftwareProjectManagement‖,CengageLearning,2011

Online Learning Resources:
http://nptel.ac.in/courses/106101061/29

III B.Tech II Semester
PROFESSIONAL ELECTIVE- III

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VI Sem	**MOBILE ADHOC NETWORKS**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A05603b	3	0	0	45	3	30	70	100

Course Objective:

- Knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
- Knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid.
- Knowledge of clustering mechanisms and the different schemes that have been employed, e.g., hierarchical, flat, and leaderless.
- Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards.

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

CO1	Describe the unique issues in ad-hoc/sensor networks.
CO2	Describe current technology trends for the implementation and deployment of wireless ad- hoc/sensor networks.
CO3	Discuss the challenges in designing MAC, routing and transport protocols for wireless ad- hoc/sensor networks.
CO4	Discuss the challenges in designing routing and transport protocols for wireless Adhoc/sensor networks.
CO5	Comprehend the various sensor network Platforms, tools and applications

COURSE CONTENT		
MODULE – 1	**Introduction to Ad Hoc Networks:**	**9H**
Characteristics of MANETs, Applications of MANETs and challenges of MANETs - Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms, Other routing algorithms.		
MODULE – 2	**Data Transmission**	**9H**
Broadcast storm problem, Broadcasting, Multicasting and Geocasting -TC Pover Ad Hoc: TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc		
MODULE – 3	**Basics of Wireless, Sensors and Applications**	**9H**
Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.		
MODULE – 4	**Data Retrieval in Sensor Networks**	**9H**
Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots-Security: Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.		
MODULE – 5	**Sensor Network Platforms and Tools**	**9H**
Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms -Operating System: Tiny OS -Imperative Language: nesC, Data flow style language: Tiny GALS, Node Level Simulators, ns- 2 and its sensor network extension.		
	Total hours:	**45 hours**

Text Books:

1. Ad Hoc and Sensor Networks –Theory and Applications, Carlos Corderio Dharma P. Aggarwal,World Scientific Publications, March 2006,ISBN –981-256-681-3

2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN –978-1-55860-914-3 (Morgan Kauffman)

References

1. Carlos Corderio, Dharma P. Aggarwal Ad Hoc and Sensor Networks: Theory and Applications World Scientific Publishing, March 2006. ISBN: 978-981-256-681-3

2. Feng Zhao, Leonidas Guibas Wireless Sensor Networks: An Information Processing Approach Morgan Kaufmann Publishers (Elsevier Science). ISBN: 978-1-55860-914-3

III B.Tech II Semester
PROFESSIONAL ELECTIVE- III

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VI Sem	**NATURAL LANGUAGE PROCESSING**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A33501	3	0	0	45	3	30	70	100

Course Objective

- Explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP)
- Discuss approaches to syn tax and semantics in NLP.
- Examine current methods for statistical approach esto machine translation.
- Teach machine learning techniques used in NLP.

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

CO1	Understand the various NLP Applications and Organization of Natural language, able to learn and implement realistic applications using Python
CO2	Apply the various Parsing techniques, Bayes Rule, Shannon game, Entropy and Cross Entropy.
CO3	Understand the fundamentals of CFG and parsers and mechanisms in ATN‘s.
CO4	Apply Semantic Interpretation and Language Modelling.
CO5	Apply the concept of Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.

COURSE CONTENT		
MODULE – 1	**Introduction to Natural language**	**9H**
The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Back ground: An outline of English Syntax.		
MODULE – 2	**Grammars and Parsing**	**9H**
Grammars and Parsing – Top – Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayees Rule, Shannon game, Entropy and Cross Entropy.		
MODULE – 3	**Grammars for Natural Language**	**9H**
Grammars for Natural Language, Movement Phenomenon in Language, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.		
MODULE – 4	**Semantic Interpretation & Language Modelling**	**9H**
Semantic Interpretation Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, The Matic roles, Speech acts & embedded sentences, Defining semantics structure model theory. **Language Modelling** Introduction, n- Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multi lingual and Cross lingual Language Modelling.		
MODULE – 5	**Machine Translation**	**9H**
Machine Translation Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches ,Current Status .Anusarakaor Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges. **Multilingual Information Retrieval** Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources. **Multilingual Automatic Summarization** Introduction, Approach esto Summarization, Evaluation, How to Builda Summarizer, Competitions and Datasets.		
	Total hours:	**45 hours**

Text books:

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory To Practice- Daniel M.Bikel and ImedZitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineetchaitanya, Prentice –Hall of India.

Reference Books:

1. Charniack, Eugene, Statistical Language Learning, MITPress,1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall,2008.
3. Manning, Christopher and Hen rich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press,1999.

Online Learning Resources:

https://nptel.ac.in/courses/106/105/106105158/http://www.nptelvideos.in/2012/11/natural-language- processing.html

III B.Tech II Semester
PROFESSIONAL ELECTIVE- III

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VI Sem	**DISTRIBUTED OPERATING SYSTEMS**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A05603c	3	0	0	45	3	30	70	100

Course Objectives

- To study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems)
- Hardware and software features that support these systems.

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

CO1	Understand the design approaches of advanced operating systems
CO2	Analyze the design issues of distributed operating systems.
CO3	Evaluate design issues of multi processor operating systems.
CO4	Identify the requirements Distributed File System and Distributed Shared Memory.
CO5	Formulate the solutions to schedule the real time applications.

COURSE CONTENT		
MODULE – 1		**9H**
Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. Theoretical Foundations: Inherent Limitations of a Distributed System, Lam port's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.		
MODULE – 2		**9H**
Distributed Mutual Exclusion: The Classification of Mutual Exclusion Algorithms, Non-Token –Based Algorithms: Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm, Token- Based Algorithms: Suzuki-Kasami's Broadcast Algorithm, Singhal's Heurisric Algorithm, Raymond's Heuristic Algorithm.		
MODULE – 3		**9H**
Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms		
MODULE – 4		**9H**
Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures Multi Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling. Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues		
MODULE – 5		**9H**
Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues		
	Total hours:	**45 hours**

Text Book:

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, Tata Mc Graw- Hill Edition 2001

Reference Book:

1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition – 2, 2007

III B.Tech II Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VI Sem	**MACHINE LEARNING LAB**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	0	0	3	36	1.5	30	70	100

Course Objectives:

- To learn about computing central tendency measures and Data pre processing techniques
- To learn about classification and regression algorithms
- To apply different clustering algorithms for a problem.

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

CO1	Understand the Mathematical and statistical prospectives of machine learning algorithms through python programming
CO2	Appreciate the importance of visualization in the data analytics solution.
CO3	Derive insights using Machine learning algorithms

Note:

a. The programs can be implemented in either JAVA or Python.
b. For Problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Java/Python.
c. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

COURSE CONTENT	
List of Experiments	
TASK–1	**CO1**
1. Compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation.	
TASK–2	**CO1**
1. Apply the following Pre-processing techniques for a given dataset. a. Attribute selection b. Handling Missing Values c. Discretization d. Elimination of Outliers	
TASK–3	
Apply KNN algorithm for classification and regression	
TASK–4	
Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results	
TASK–5	
Demonstrate decision tree algorithm for a regression problem	
TASK–6	
Apply Random Forest algorithm for classification and regression	
TASK–7	
Demonstrate Naïve Bayes Classification algorithm.	
TASK–8	
Apply Support Vector algorithm for classification	
TASK–9	
Demonstrate simple linear regression algorithm for a regression problem	
TASK–10	
Apply Logistic regression algorithm for a classification problem	
TASK–11	
Demonstrate Multi-layer Perceptron algorithm for a classification problem	
TASK–12	
Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.	
TASK–13	

Demonstrate the use of Fuzzy C-Means Clustering	
TASK–14	
Demonstrate the use of Expectation Maximization based clustering algorithm	
Total hours:	**36 hours**

Projects

1. Predicting the Sale price of a house using Linear regression
2. Spam classification using Naïve Bayes algorithm
3. Predict car sale prices using Artificial Neural Networks
4. Predict Stock market trends using LSTM
5. Detecting faces from images

References:

1. Python Machine Learning Workbook for beginners, AI Publishing, 2020.

Online Learning Resources/ Virtual Labs:

1) Machine Learning A-Z (Python & R in Data Science Course) | Udemy
2) Machine Learning | Coursera

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III B.Tech II Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VI Sem	**CRYPTOGRAPHY AND NETWORK SECURITY LAB**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	0	0	3	36	1.5	30	70	100

Course Outcomes: After completion of the course, students will be able to	
CO1	Demonstrate basic encryption techniques such as XOR, AND operations, Caesar cipher, Substitution cipher, and Hill cipher. **(BL)**
CO2	Implement symmetric encryption algorithms like DES, Blowfish, Rijndael (AES), and RC4. **(BL)**
CO3	Apply public key cryptography techniques such as RSA. **(BL)**
CO4	Use cryptographic hash functions (MD5, SHA-1) and implement key exchange mechanisms like Diffie-Hellman. **(BL)**
CO5	Analyze and compare various cryptographic techniques for confidentiality and integrity. **(BL)**

COURSE CONTENT
List of Experiments
TASK–1
Write a C program that contains a string (char pointer) with a value ‗Hello world'. The program should XOR each character in this string with 0 and displays the result.
TASK–2
Write a C program that contains a string (char pointer) with a value ‗Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
TASK–3
Write a Java program to perform encryption and decryption using the following algorithms a. Ceaser cipher b. Substitution cipher c. Hill Cipher
TASK–4
Write a C/JAVA program to implement the DES algorithm logic.
TASK–5

Write a C/JAVA program to implement the Blowfish algorithm logic.	
TASK–6	
Write a C/JAVA program to implement the Rijndael algorithm logic.	
TASK–7	
Write the RC4 logic in Java Using Java cryptography; encrypt the text ―Hello world‖ using Blowfish. Create your own key using Java key tool.	
TASK–8	
Write a Java program to implement RSA algorithm.	
TASK–9	
Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.	
TASK–10	
Calculate the message digest of a text using the SHA-1 algorithm in JAVA.	
TASK–11	
Calculate the message digest of a text using the MD5 algorithm in JAVA.	
Total hours:	**36 hours**

Textbooks:

1. **Cryptography and Network Security**, William Stallings, Pearson Education, 7th Edition.
2. **Cryptography and Network Security**, Behrouz A. Forouzan, McGraw Hill, 3rd Edition.

Reference Books:

1. **Applied Cryptography**, Bruce Schneier, Wiley, 2nd Edition.
2. **Network Security: Private Communication in a Public World**, Charlie Kaufman, Radia Perlman, and Mike Speciner, Pearson Education, 2nd Edition.
3. **Cryptography and Network Security**, Atul Kahate, McGraw-Hill Education, 3rd Edition.

Online Learning Resources / Virtual Labs:

- NPTEL Courses on Cryptography
- Virtual Labs – Cryptography Lab (IIT Kharagpur)
- GeeksforGeeks – Cryptography Algorithms
- Java Cryptography Tutorials – Oracle Docs

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III B.Tech II Semester

<table>
<tr><td colspan="8">NARAYANA ENGINEERING COLLEGE :: GUDUR</td></tr>
<tr><td>VI Sem</td><td colspan="6">SOFT SKILLS</td><td>R23</td></tr>
<tr><td rowspan="2">Course Code</td><td colspan="3">Hours / Week</td><td rowspan="2">Total hrs</td><td>Credit</td><td colspan="3">Max Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>TOTAL</td></tr>
<tr><td></td><td>1</td><td>0</td><td>2</td><td>44</td><td>2</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="8">Course Objectives:
• To encourage all round development of the students by focusing on soft skills
• To make the students aware of critical thinking and problem-solving skills
• To enhance healthy relationship and understanding within and outside an organization
• To function effectively with heterogeneous teams</td></tr>
<tr><td colspan="8">Course Outcomes: After completion of the course, students will be able to</td></tr>
<tr><td>CO1</td><td colspan="7">List out various elements of soft skills</td></tr>
<tr><td>CO2</td><td colspan="7">Describe methods for building professional image</td></tr>
<tr><td>CO3</td><td colspan="7">Apply critical thinking skills in problem solving</td></tr>
<tr><td>CO4</td><td colspan="7">Analyse the needs of an individual and team for well-being</td></tr>
<tr><td>CO5</td><td colspan="7">Assess the situation and take necessary decisions</td></tr>
<tr><td>CO6</td><td colspan="7">Create a productive work place atmosphere using social and work-life skills ensuring personal and emotional well-being</td></tr>
</table>

COURSE CONTENT		
MODULE – 1	**Soft Skills & Communication Skills**	**9H**

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills - Significance, process, types - Barriers of communication - Improving techniques

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

MODULE – 2	**Critical Thinking**	**9H**

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking - Positive thinking - Reflection

Activities:

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

MODULE – 3	**Problem Solving & Decision Making**	**8H**

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.

Case Study & Group Discussion

MODULE – 4	**Emotional Intelligence & Stress Management**	**8H**

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.

Providing opportunities for the participants to narrate certain crisis and stress – ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

MODULE – 5	**Corporate Etiquette**	**10H**

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette -Corporate grooming tips - Overcoming

challenges

Activities

Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

NOTE-:

1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.

Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear.

Total hours:	**44 hours**

Text Book:

1. Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, Personality Development and Soft Skills: Preparing for Tomorrow, K I 2018 ,esuoH gnihsilbuP lanoitanretnI

Reference Books

1. Sharma, Prashant, Soft Skills: Personality Development for Life Success, BPB Publications 2018.
2. Alex K,Soft SkillsS.Chand& Co, 2012 (Revised edition)
3. Gajendra Singh Chauhan& Sangeetha Sharma,Soft Skills: An Integrated Approach to Maximise PersonalityPublished by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, Soft Skills and Employability Skills, Cambridge University Press, 2018
5. Dr. Rajiv Kumar Jain, Dr. Usha Jain,Life Skills(Paperback English)Publisher : Vayu Education of India, 2014

Online Learning Resources:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc

7. https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/
8. https://onlinecourses.nptel.ac.in/noc24_hs15/preview
9. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

III B.Tech II Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VI Sem	**TECHNICAL PAPER WRITING & IPR**							**R23**
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A52601	2	0	0	44	0	30	70	100

Course Objectives:·

1. To enable the students to practice the basic skills of research paper writing
2. To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
3. To practice the basic skills of performing quality literature review
4. To help them in knowing the significance of real life practice and procedure of Patents.
5. To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

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

CO1	Identify key secondary literature related to their proposed technical pap writing
CO2	Explain various principles and styles in technical writing
CO3	Use the acquired knowledge in writing a research/technical paper
CO4	Analyse rights and responsibilities of holder of Patent, Copyright, rademark, International Trademark etc.
CO5	Evaluate different forms of IPR available at national & international evel
CO6	Develop skill of making search of various forms of IPR by using modern ools and techniques.

COURSE CONTENT		
MODULE – 1	**Principles of Technical Writing**	**9H**
Principles of Technical Writing: styles in technical writing; clarity, precision, coherence andlogical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings- discussing your limitations -hedging and criticizing -plagiarism and paraphrasing		
MODULE – 2	**Technical Research Paper Writing**	**9H**
Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature- Problemsand Framing Research Questions- Synopsis.		
MODULE – 3	**Process of research**	**8H**
Process of research: publication mechanism: types of journals- indexing-seminars- conferences- proof reading –plagiarism style; seminar & conference paper writing; Methodology-discussion-results-citation rules		
MODULE – 4	**Introduction to Intellectual property & Trade Marks**	**8H**
Introduction to Intellectual property: Introduction, types of intellectual property, International organizations, agencies and ties, importance of intellectual property rights Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and uating trade mark, trade mark registration processes.		
MODULE – 5	**Law of copy rights & Law of patents**	**10H**
Law of copy rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.Patent law, intellectual property audits.		
	Total hours:	**44 hours**

Textbooks:

1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013
2. Meenakshi Raman, Sangeeta Sharma. Technical Communication:Principles and practices.Oxford.

Reference Books:

1. R.Myneni, Law of Intellectual Property, 9th Ed, Asia law House, 2019.
2. Prabuddha Ganguli,Intellectual Property Rights Tata Mcgraw Hill, 2001
3. P.Naryan,Intellectual Property Law, 3rd Ed ,Eastern Law House, 2007.
4. Adrian Wallwork. English for Writing Research PapersSecond Edition. Springer Cham Heidelberg New York ,2016
5. Dan Jones, Sam Dragga, Technical Writing Style

Online Resources

1. https://theconceptwriters.com.pk/principles-of-technical-writing/
2. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
3. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
4. https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal/
5. https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf
6. https://lawbhoomi.com/intellectual-property-rights-notes/
7. https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf

IV B.Tech I Semester

<table>
<tr><td colspan="8">NARAYANA ENGINEERING COLLEGE :: GUDUR</td></tr>
<tr><td>VII Sem</td><td colspan="6">DEEP LEARNING</td><td>R23</td></tr>
<tr><td rowspan="2">Course Code</td><td colspan="3">Hours / Week</td><td rowspan="2">Total hrs</td><td>Credit</td><td colspan="2">Max Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>TOTAL</td></tr>
<tr><td>23A30602T</td><td>2</td><td>1</td><td>0</td><td>42</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="8">Course Objectives:
Demonstrate the major technology trends driving Deep Learning
Build, train, and apply fully connected deep neural networks
Implement efficient (vectorized) neural networks
Analyse the key parameters and hyper parameters in a neural network's architecture.</td></tr>
<tr><td colspan="8">Course Outcomes: After completion of the course, students will be able to</td></tr>
<tr><td>CO1</td><td colspan="7">Demonstrate the mathematical foundation of neural network</td></tr>
<tr><td>CO2</td><td colspan="7">Describe the machine learning basics</td></tr>
<tr><td>CO3</td><td colspan="7">Differentiate architecture of deep neural network</td></tr>
<tr><td>CO4</td><td colspan="7">Build a convolutional neural network</td></tr>
<tr><td>CO5</td><td colspan="7">Build and train RNN and LSTMs</td></tr>
</table>

COURSE CONTENT		
MODULE – 1	**Linear Algebra & Probability and Information Theory**	**8H**
Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis. **Probability and Information Theory:** Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.		
MODULE – 2	**Machine Learning & Deep Feed forward Networks**	**9H**
Machine Learning: Basics and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. **Deep Feed forward Networks**: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms		
MODULE – 3	**Regularization for Deep Learning & Optimization for Training Deep Models**	**8H**
Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. **Optimization for Training Deep Models**: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.		
MODULE – 4	**Convolutional Networks**	**9H**
Convolutional Networks: The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks.		
MODULE – 5	**Sequence Modeling**	**8H**
Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.		
	Total hours:	**42 hours**

Text books:

1. Ian Good fellow, Yoshua Bengio, Aaron Courville, —Deep Learning‖, MIT Press,2016.
2. Josh Patterson and Adam Gibson, —Deep learning: A practitioner's approach‖, O'Reilly Media, First Edition,2017.

Reference Books:

1. Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers,2019.
2. Deep learning Cook Book, Practical recipes to get started Quickly, Douwe Osinga, O'Reilly, Shroff Publishers,2019.

Online Learning Resources:

1. https://keras.io/datasets/
2. http://deeplearning.net/tutorial/deeplearning.pdf
3. https://arxiv.org/pdf/1404.7828v4.pdf
4. https://www.cse.iitm.ac.in/~miteshk/CS7015.html
5. https://www.deeplearningbook.org
6. https://nptel.ac.in/courses/106105215

IV B.Tech I Semester

<table>
<tr><td colspan="8">NARAYANA ENGINEERING COLLEGE :: GUDUR</td></tr>
<tr><td rowspan="2">VII Sem</td><td colspan="6">Management Course- II
BUSINESS ETHICS AND CORPORATE GOVERNANCE</td><td>R23</td></tr>
<tr><td rowspan="2">Course Code</td><td colspan="3">Hours / Week</td><td rowspan="2">Total hrs</td><td>Credit</td><td colspan="3">Max Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>TOTAL</td></tr>
<tr><td>23A52701a</td><td>2</td><td>0</td><td>0</td><td>44</td><td>2</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="8">COURSE OBJECTIVES :The objectives of this course are
• To make the student understand the principles of business ethics
• To enable them in knowing about the ethics in management
• To facilitate the student‘ role in corporate culture
• To impart knowledge about the fair-trade practices
• To encourage the student in knowing about the corporate governance</td></tr>
<tr><td colspan="8">Course Outcomes: After completion of the course, students will be able to</td></tr>
<tr><td>CO1</td><td colspan="7">Understand the Ethics and different types of Ethics.</td></tr>
<tr><td>CO2</td><td colspan="7">Understand business ethics and ethical practices in management</td></tr>
<tr><td>CO3</td><td colspan="7">Understand the role of ethics in management</td></tr>
<tr><td>CO4</td><td colspan="7">Apply the knowledge of professional ethics & technical ethics</td></tr>
<tr><td>CO5</td><td colspan="7">Analyze corporate law, ethics, codes & principles</td></tr>
<tr><td>CO6</td><td colspan="7">Evaluate corporate governance & corporate scams</td></tr>
</table>

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

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior.. Value systems - Business Ethics - Types, Characteristics, Factors, Contradictions and Ethical Practices in Management - Corporate Social Responsibility – Issues of Management – Crisis Management.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the meaning of loyalty and ethical Behavior
- Explain various types of Ethics
- Analyze issues & crisis of management

MODULE – 2	ETHICS IN MANAGEMENT	9H

Introduction- Ethics in production, finance, Human resource management and Marketing Management - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures - Culture and Individual Ethics – professional ethics and technical ethics.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the meaning of Ethics in various areas of management
- Compare and contrast professional ethics and technical ethics
- Develop ethical values in self and organization

MODULE – 3	CORPORATE CULTURE	8H

Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language - Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change.

LEARNING OUTCOMES:- After completion of this unit student will

- Define corporate culture
- Understand the key elements of corporate culture
- Analyze organization leadership and corporate culture

MODULE – 4	LEGAL FRAME WORK	8H

Law and Ethics -Agencies enforcing Ethical Business Behavior - Legal Impact – Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding

Health and wellbeing of Customers – Corporate law, Securities and financial regulations, corporate governance codes and principles.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand Law and Ethics
- Analyze Different fair trade practices
- Make use of Environmental Protection and Fair Trade Practices

MODULE – 5	**CORPORATE GOVERNANCE**	**10H**

Introduction - Meaning – Corporate governance code, transparency & disclosure - Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work - Corporate scams - Committees in India and abroad, corporate social responsibility. BoDs composition, Cadbury Committee - Various committees - Reports -

Benefits and Limitations.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand corporate governance code
- Analyze role of auditors, board of directors and shareholders in corporate governance
- Implementing corporate social responsibility in India.

Total hours:	**44 hours**

Text books.

1. Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017

2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH. June 2010

Reference books

1. Dr. K. Nirmala, KarunakaraReaddy. Business Ethics and Corporate Governance, HPH

2. H.R.Machiraju: Corporate Governance, HPH, 2013
3. K. Venkataramana, Corporate Governance, SHBP.

1. N.M.Khandelwal. Indian Ethos and Values for Managers

Online

Resources:

1. https://onlinecourses.nptel.ac.in/noc21_mg46/
2. https://archive.nptel.ac.in/courses/110/105/110105138/

3. https://onlinecourses.nptel.ac.in/noc21_mg54/
4. https://onlinecourses.nptel.ac.in/noc22_mg54/
5. https://archive.nptel.ac.in/courses/109/106/109106117/

IV B.Tech I Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VII Sem	**Management Course- II** **E-Business**							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	2	0	0	44	2	30	70	100

Course Objectives: The Objectives of this course are

To provide knowledge on emerging concept on E-Business related aspect.

To understand various electronic markets & business models.

To impart the information about electronic payment systems & banking.

To create awareness on security risks and challenges in E-commerce

To the students aware on different e-marketing channels & strategies

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

CO1	Remember E-Business & its nature, scope and functions.
CO2	Understand E-market-Models which are practicing by the organizations
CO3	Apply the concepts of E-Commerce in the present globalized world.
CO4	Analyze the various E-payment systems & importance of net banking.
CO5	Evaluate market research strategies & E-advertisements.
CO6	Understand importance of E-security & control

COURSE CONTENT		
MODULE – 1	**Electronic Business**	**9H**

Introduction – Nature, meaning, significance, functions and advantages - Definition of Electronic Business - Functions of Electronic Commerce (EC)-Advantages & Disadvantages of E-Commerce –E- Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries.

Learning Outcomes: -After completion of this unit student

- Understand the concept of E-Business
- Contrast and compare E-Commerce & E-Business
- Evaluate opportunities of E-commerce for industry

MODULE – 2	**Electronic Markets and Business Models**	**9H**

Introduction –E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals -Business Models- Business to Business (B2B)-Business to Customers(B2C) - Business to Government(B2G)-Auctions-B2B Portals in India

Learning Outcomes: -After completion of this unit student will

- Understand the concept of business models
- Contrast and compare Vertical portal and Horizontal portals
- Analyze the B2B,B2C and B2G model

MODULE – 3	**Electronic Payment Systems**	**8H**

Introduction to electronic payment systems (EPS) -Types of electronic payments -Credit/debit cards, e- wallets, UPI, and crypto currencies -Smart cards and digital wallets: Features and usage -Electronic Fund Transfer (EFT): Role in business transactions -Infrastructure requirements and regulatory aspects of e-payments

Learning Outcomes: -After completion of this unit student will

- Understand the Electronic payment system
- Contrast and compare EFT and smart cards
- Analyze debit card and credit cards

MODULE – 4	E-Security	8H

Security risks and challenges in electronic commerce - Cyber threats - Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) -Firewalls in securing e-business platforms.

Learning Outcomes: -After completion of this unit student will

- Understand E-Security
- Contrast and compare security protocols and public network
- Evaluate on Digital signature

MODULE – 5	E-Marketing	10H

Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research– – E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (eCRM) E-supply chain management (e-SCM)

Learning Outcomes: -After completion of this unit student will

- Understand the concept of online marketing
- Apply the knowledge of online marketing
- Compare e-CRM and e-SCM

Total hours:	**44 hours**

Text books.

1. Arati Oturkar&Sunil Khilari. E-Business. Everest Publishing House, 2022

2. P.T.S Joseph. E-Commerce, Fourth Edition, Prentice Hall of India, 2011

Reference books

1. Debjani, Kamalesh K Bajaj. E-Commerce, Second Edition Tata McGraw-Hill's, 2005

2. Dave Chaffey.E-Commerce E-Management, Second Edition, Pearson, 2012.

3. Henry Chan. E-Commerce Fundamentals and Application, RaymondLeathamWiley India 2007

4. S. Jaiswal. E-Commerce GalgotiaPublication Pvt Ltd., 2003.

Online

Resources:

https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771

https://www.slideshare.net/VikramNani/e-commerce-business-models

https://www.slideshare.net/RiteshGoyal/electronic-payment-system

https://www.slideshare.net/WelingkarDLP/electronic-security

https://www.slideshare.net/Ankitha2404/emarketing-ppt

IV B.Tech I Semester

<table>
<tr><td colspan="8">NARAYANA ENGINEERING COLLEGE :: GUDUR</td></tr>
<tr><td>VII Sem</td><td colspan="6">Management Course- II
Management Science</td><td>R23</td></tr>
<tr><td rowspan="2">Course Code</td><td colspan="3">Hours / Week</td><td rowspan="2">Total hrs</td><td>Credit</td><td colspan="3">Max Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>TOTAL</td></tr>
<tr><td></td><td>2</td><td>0</td><td>0</td><td>44</td><td>2</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="8">Course Objectives: The Objectives of this course are
• To provide fundamental knowledge on Management, Administration, Organization &
• its concepts.
• To make the students understand the role of management in Production
• To impart the concept of HRM in order to have an idea on Recruitment, Selection,
• Training & Development, job evaluation and Merit rating concepts
• To create awareness on identify Strategic Management areas & the PERT/CPM for
• better Project Management
• To make the students aware of the contemporary issues in modern management</td></tr>
<tr><td colspan="8">Course Outcomes: After completion of the course, students will be able to</td></tr>
<tr><td>CO1</td><td colspan="7">Remember the concepts & principles of management and designs of organization in a practical world</td></tr>
<tr><td>CO2</td><td colspan="7">Understand the knowledge of Work-study principles & Quality Control techniques in industry</td></tr>
<tr><td>CO3</td><td colspan="7">Apply the process of Recruitment & Selection in organization.</td></tr>
<tr><td>CO4</td><td colspan="7">Analyze the concepts of HRM & different training methods.</td></tr>
<tr><td>CO5</td><td colspan="7">Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.</td></tr>
<tr><td>CO6</td><td colspan="7">Create awareness on contemporary issues in modern management & technology.</td></tr>
</table>

COURSE CONTENT		
MODULE – 1	**INTRODUCTION TO MANAGEMENT**	**9H**

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor's Scientific Theory- Henry Fayol's principles - Elton Mayo's Human relations - **Organizational Designs** - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

LEARNING OUTCOMES: At the end of the Unit, the students will be able to

- Understand the concept of management and organization
- Apply the concepts & principles of management in real life industry.
- Analyze the organization chart & structure of an enterprise.

MODULE – 2	**OPERATIONS MANAGEMENT**	**9H**

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- **Material Management -** Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - **Marketing Management -** Concept - Meaning - Nature- Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

LEARNING OUTCOMES: At the end of the Unit, the students will be able to

- Understand the core concepts of Operations Management
- Apply the knowledge of Quality Control, Work-study principles in real life industry.
- Evaluate Materials departments & Determine EOQ
- Analyze Marketing Mix Strategies for an enterprise.
- Create and design advertising and sales promotion

MODULE – 3	**HUMAN RESOURCES MANAGEMENT (HRM)**	**8H**

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process - Employee Training and Development - methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

LEARNING OUTCOMES: At the end if the Unit, the students will be able to

- Understand the concepts of HRM, Recruitment, Selection, Training & Development
- Analyze the need of training
- Evaluate performance appraisal
- Design the basic structure of salaries and wages

MODULE – 4	STRATEGIC & PROJECT MANAGEMENT	8H

Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - **Project Management -** Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

LEARNING OUTCOMES: At the end of the Unit, the students will be able to

- Understand Mission, Objectives, Goals & strategies for an enterprise
- Apply SWOT Analysis to strengthen the project
- Analyze Strategy formulation and implementation
- Evaluate PERT and CPM Techniques

MODULE – 5	CONTEMPORARY ISSUES IN MANAGEMENT	10H

Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management – employee engagement and retention - Business Process Re-engineering and Bench Marking - Knowledge Management –

change management –sustainability and corporate social responsibility.

LEARNING OUTCOMES At the end if the Unit, the students will be able to

- Understand modern management techniques
- Apply Knowledge in Understanding in TQM, SCM
- Analyze CRM, BPR
- Evaluate change management & sustainability

Total hours:	**44 hours**

Text books.

1. Frederick S. Hillier, Mark S. Hillier. Introduction to Management Science, October 26, 2023
2. A.R Aryasri, Management Science, TMH, 2019

Reference books

1. 1. Stoner, Freeman, Gilbert.Management, Pearson Education, New Delhi, 2019.
2. Koontz & Weihrich, Essentials of Management, 6/e, TMH, 2005.
3. Thomas N.Duening & John M.Ivancevich, Management Principles and Guidelines, Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Samuel C.Certo, Modern Management, 9/e, PHI, 2005

Online

Resources:

1. https://www.slideshare.net/slideshow/introduction-to-management-and-organization- 231308043/231308043
2. https://nptel.ac.in/courses/112107238
3. https://archive.nptel.ac.in/courses/110/104/110104068/
4. https://archive.nptel.ac.in/courses/110/105/110105069/
5. https://onlinecourses.nptel.ac.in/noc24_mg112/

IV B.Tech I Semester
PROFESSIONAL ELECTIVE-IV

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VII Sem	SOFTWARE ARCHITECTURE AND DESIGN PATTERNS							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	0	0	43	3	30	70	100

Course Objectives:

- To understand the concept of patterns and the Catalog.
- To discuss the Presentation tier design patterns and their affect on: sessions, client access, validation and consistency.
- To understand the variety of implemented bad practices related to the Business and Integration tiers.

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

CO1	To highlight the evolution of patterns.
CO2	To learn how to add functionality to designs while minimizing complexity.
CO3	To learn what design patterns really are, and are not.
CO4	To know about specific design patterns.
CO5	To learn how to use design patterns to keep code quality high without over design.

COURSE CONTENT		
MODULE – 1		**9H**
Envisioning Architecture: The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views. Creating an Architecture: Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.		
MODULE – 2		**8H**
Analyzing Architectures: Architecture Evaluation, Architecture design decision making, ATAM, CBAM. Moving from one system to many: Software Product Lines, Building systems from off the shelf components, Software architecture in future.		
MODULE – 3		**9H**
Patterns: Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage.Creational and Structural patterns: Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight.		
MODULE – 4		**8H**
Behavioural patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy. template method, visitor.		
MODULE – 5		**9H**
Case Studies: A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development.		
	Total hours:	**43 hours**

Text Books:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education.

References:

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006 6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.

7. Design Patterns in C#, Steven John metsker, Pearson education, 2004.
8. Pattern Oriented Software Architecture, F.Buschmann &others, John Wiley & Sons.

IV B.Tech I Semester
PROFESSIONAL ELECTIVE-IV

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	BLOCK CHAIN TECHNOLOGY							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05701b	3	0	0	42	3	30	70	100

Course Objectives:

- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them.
- Design, build, and deploy smart contracts and distributed applications.
- Integrate ideas from block chain technology into their own projects.

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

CO1	Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
CO2	Identify the risks involved in building Block chain applications.
CO3	Review of legal implications using smart contracts.
CO4	Choose the present landscape of Blockchain implementations and Understand Crypto currency markets
CO5	Examine how to profit from trading crypto currencies.

COURSE CONTENT		
MODULE – 1	**Introduction**	**8H**
Introduction, Scenarios, Challenges Articulated, Block chain, Block chain Characteristics, Opportunities Using Block chain, History of Block chain. Evolution of Block chain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Block chain Evolution, Consortia, Forks, Public Block chain Environments, Type of Players in Block chain Ecosystem, Players in Market.		
MODULE – 2	**Block chain Concepts**	**9H**
Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on block chain, data storage on block chain, wallets, coding on block chain: smart contracts, peer-to-peer network, types of block chain nodes, risk associated with bloc chain solutions, life cycle of block chain transaction.		
MODULE – 3	**Architecting Block chain solutions**	**9H**
Introduction, Obstacles for Use of Block chain, Block chain Relevance Evaluation Framework, Block chain Solutions Reference Architecture, Types of Block chain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Block chain Solutions, Architecture Considerations, Architecture with Block chain Platforms, Approach for Designing Block chain Applications.		
MODULE – 4	**Ethereum Block chain Implementation**	**8H**
Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura, Ether scan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, Open Zeppel in Contracts .		
MODULE – 5	**Hyper ledger Block chain Implementation**	**8H**
Hyper ledger Implementation: Introduction, Use Case – Car Ownership Tracking, Hyper ledger Fabric, Hyper ledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chain code Functions Using Client Application. **Advanced Concepts in Block chain:** Introduction, Inter Planetary File System (IPFS), Zero Knowledge Proofs, Oracles, Self-Sovereign Identity, Block chain with IoT and AI/ML Quantum Computing and Block chain, Initial Coin Offering, Block chain Cloud Offerings, Block chain and its Future Potential.		
	Total hours:	**42 hours**

Textbooks:

1. Ambadas, Arshad Sarfarz Ariff, Sham —Block chain for Enterprise Application Developers‖, Wiley, 2020
2. Andreas M. Antonopoulos, —Mastering Bitcoin: Programming the Open Blockchain‖, O'Reilly, 2017

Reference Books: 1. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill. 2. Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly
Online Learning Resources: **https://github.com/blockchainedindia/resources**

IV B.Tech I Semester
PROFESSIONAL ELECTIVE-IV

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	AUGMENTED REALITY AND VIRTUAL REALITY							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05701c	3	0	0	48	3	30	70	100

Course Objective:

The primary objective of this course is to introduce students to the foundational principles and technologies of Virtual Reality (VR) and Augmented Reality (AR), along with the key devices, modeling techniques, and interaction mechanisms involved in creating immersive environments. The course will cover the essentials of VR and AR, including hardware, software, and human perception, as well as advanced concepts such as 3D modeling, interaction design, and audio rendering. Students will gain hands-on experience in the use of VR/AR systems and explore the challenges and methodologies for building interactive virtual environments.

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

CO1	Understand the core concepts of Virtual Reality and Augmented Reality, and their differences.
CO2	Learn about the hardware and software components required for VR and AR systems, as well as the impact of human physiology and perception on the virtual experience.
CO3	Gain knowledge of input devices (trackers, navigation, and gesture interfaces) and output devices (graphics, sound displays, and haptic feedback).
CO4	Develop skills in modeling techniques, including geometric, kinematics, physical, and behavior modeling for VR and AR environments.
CO5	Explore the technologies and methodologies used to create Augmented Reality systems, including marker-based AR and AR software development.

COURSE CONTENT		
MODULE – 1		**10H**
INTRODUCTION TO VIRTUAL REALITY (VR): Defining Virtual Reality, Key elements of virtual reality experience, Virtual Reality, Telepresence, Augmented Reality and Cyberspace. **Bird's-Eye View:** Hardware, Software, Human Physiology and Perception.		
MODULE – 2		**10H**
Input Devices: (Trackers, Navigation, and Gesture Interfaces): Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces. **Output Devices:** Graphics displays, sound displays & haptic feedback.		
MODULE – 3		**10H**
Modeling: Geometric modeling, Kinematics modeling, Physical modeling, Behaviour modeling, Model management.		
MODULE – 4		**10H**
Augmented Reality (AR): Taxonomy, Technology and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Enhancing interactivity in AR Environments, Evaluating AR systems **AR software development :** AR software, Camera parameters and camera calibration, Marker-based augmented reality, AR Toolkit.		
MODULE – 5		**10H**
Interaction & Audio: Interaction - Motor Programs and Remapping, Locomotion, Manipulation, Social Interaction. Audio -The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering. Interaction - Motor Programs and Remapping, Locomotion, Manipulation, Social Interaction. Audio -The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering.		
	Total hours:	**50 hours**

Text Books:

1. Virtual Reality Technology, Second Edition, Gregory C. Burdea & Philippe Coiffet, John Wiley & Sons, Inc, 2017.
2. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016.

References:

1. Rajesh K. Maurya, Computer Graphics with Virtual Reality System,

3rd Edition, Wiley Publication, 2018.

2. William R. Sherman and Alan B. Craig, Understanding Virtual Reality Interface, Application, and Design, 2nd Edition, Morgan Kaufmann Publishers, Elsevier, 2019.
3. Grigore C.Burdea, Philippe Coiffet,Virtual Reality Technology, 2nd Edition, Wiley,2017.
4. K.S. Hale and K. M. Stanney, Handbook on Virtual Environments, 2nd Edition, CRC Press, 2015.

Online Learning Resources:

1. http://vr.cs.uiuc.edu/vrbook.pdf
2. https://nptel.ac.in/courses/106/106/106106138/

IV B.Tech I Semester
PROFESSIONAL ELECTIVE-IV

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VII Sem	INTERNET OF THINGS							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A3501T	3	0	0	45	3	30	70	100

Course Objectives:

- Understand the basics of Internet of Things and protocols.
- Discuss the requirement of IoT technology
- Introduce some of the application areas where IoT can be applied.
- Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management

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

CO1	Understand general concepts of Internet of Things.
CO2	Apply design concept to IoT solutions
CO3	Analyze various M2M and IoT architectures
CO4	Evaluate design issues in IoT applications
CO5	Create IoT solutions using sensors, actuators and Devices

COURSE CONTENT		
MODULE – 1	**Introduction to IoT**	**9H**
Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates		
MODULE – 2	**Prototyping IoT Objects using Microprocessor / Microcontroller**	**10H**
Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.		
MODULE – 3	**IoT Architecture and Protocols**	**9H**
Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.		
MODULE – 4	**Device Discovery and Cloud Services for IoT**	**9H**
Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.		
MODULE – 5	**UAV IoT**	**8H**
Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.		
	Total hours:	**45 hours**

Text books:

1. Vijay Madisetti and Arshdeep Bahga, — Internet of Things (A Hands-on-Approach)‖, 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis; George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.

Reference Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, — From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis daCosta, —Rethinking the Internet of Things: A Scalable

Approach to Connecting Everything‖, 1st Edition, Apress Publications, 2013
5. Cuno Pfister, Getting Started with the Internet of Things, O" Reilly Media, 2011, ISBN: 9781- 4493- 9357-1
6. DGCA RPAS Guidance Manual, Revision 3 – 2020
7. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal

Online Learning Resources:

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5
4. https://nptel.ac.in/courses/108108098/4

IV B.Tech I Semester
PROFESSIONAL ELECTIVE-V

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VII Sem	AGILE METHODOLOGIES							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05702a	3	0	0	43	3	30	70	100

Course Objectives:

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide good understanding of software design and a set of software technologies and APIs.
- To carry out detailed examination and demonstration of Agile development and testing techniques.
- To discuss Agile software development.

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

CO1	Realize the importance of interacting with business stakeholders in determining the requirements for a software system.
CO2	Perform iterative software development processes: how to plan them, how to execute them.
CO3	Point out the impact of social aspects on software development success.
CO4	Develop techniques and tools for improving team collaboration and software quality.
CO5	Perform Software process improvement as an ongoing task for development teams.
CO 6	Show how agile approaches can be scaled up to the enterprise level.

COURSE CONTENT		
MODULE – 1	**Agile Methodology**	**9H**
Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values.		
MODULE – 2	**Agile Processes**	**8H**
Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.		
MODULE – 3	**Agility And Knowledge Management**	**8H**
Agile Information Systems – Agile Decision Making - Earls Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).		
MODULE – 4	**Agility and Requirements Engineering**	**9H**
Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.		
MODULE – 5	**Agility And Quality Assurance**	**9H**
Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.		
	Total hours:	**43 hours**

Text books:

1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

Reference Books:

1. Craig Larman, ―Agile and Iterative Development: A Manager‗s Guide‖, Addison-Wesley, 2004.

2. Kevin C. Desouza, —Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007.

Online Learning Resources:

https://www.nptelvideos.com/video.php?id=904

IV B.Tech I Semester
PROFESSIONAL ELECTIVE-V

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VII Sem	METAVERSE							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	0	0	44	3	30	70	100

Course Objectives:

The main objectives of the course are to:

1. Present and discuss Metaverse characteristics, concepts and layers.
2. Explain and analyse Metaverse technologies, tools, platforms, and applications.
3. Discuss design theories and practices relevant to the Metaverse.
4. Explore cyber security and cybercrime in the Metaverse.
5. Examine open challenges in the Metaverse.

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

CO1	Understand the characteristics, and interdisciplinary nature of the Metaverse, the opportunities and risks it presents.
CO2	Analyze Metaverse layers, the technologies used in creating them, as well as design theories and practices for Metaverse.
CO3	Examine and discuss Metaverse platforms, applications and the latest technological developments in this area.
CO4	Identify cyber security issues, understand cybercrime, and discuss the open challenges.
CO5	Building Metaverse Applications

COURSE CONTENT		
MODULE – 1		**9H**
Metaverse fundamentals: Metaverse evolution, Metaverse importance and characteristics, the interdisciplinary nature of the Metaverse, Metaverse opportunities and risks, Computer-mediated communication (social presence theory, social information processing theory, media richness theory, cyborg theory), Avatar-mediated communication.		
MODULE – 2		**9H**
The seven layers of Metaverse: Experience Discovery, Creator economy, Spatial computing, Decentralization, Human interface, Infrastructure Metaverse Technologies part I: AR/VR/MR/XR, 3D reconstruction, Game engines, Smart glasses, wearables, haptic devices, headsets and headwear.		
MODULE – 3		**9H**
Metaverse technologies part II: Blockchain, smart contracts, tokens, NFTs, Cryptography, Artificial Intelligence (AI), Internet of Things (IoT), Edge computing and 5G, 6G.Design theories and practices: Social presence and co-presence, Motion sickness and cybersickness, Uncanny valley, Sense of self- location, sense of agency and sense of body ownership, Universal simulation principle, Prototyping, Evaluation techniques (qualitative and quantitative).		
MODULE – 4		**8H**
Tools and technologies for Metaverse UX and UI: Tools and services for avatar systems, Spatial user interface design, Cross-platform user experience design, Multimodal user interface, Technologies and devices for human computer interaction in Metaverse, Metaverse platforms: Decentral and, SANDBOX, Roblox, Axie Infinity, uHive, Hyper Nation, Nakamoto (NAKA), Metahero (HERO), Star Atlas (ATLAS), Bloktopia (BLOK), Stageverse, Spatial, PalkaCity, Viverse, Sorare, Illuvium, Upland, Second Life, Sansar, Sensorium Galaxy		
MODULE – 5		**9H**
Metaverse applications - part I: Gaming and entertainment, Travel and tourism, Education and learning, Remote working, Commerce and business, Metaverse		

applications - part II: Real estate, Banking and Finance, Healthcare, Social media, Fashion, Metaverse and cyber security: Cyber security concerns in Metaverse: Social engineering attacks, Data theft, Decentralization vs vulnerabilities, Cyber security risks in Metaverse: process, people, technology, Metaverse and cybercrime: Scam and theft, Rug pull, Money manipulation and wash trading, Money laundering, Metaverse challenges and open issues: Persistency, Interoperability and scalability, Maturity, Regulation, Usefulness and ease-of-use, Privacy and data security, Content creation, NFTs and creator economy, Social, legal and ethical issues in the Metaverse	
Total hours:	**44 hours**

Text books

The Metaverse, Terry Winters, Independently published, 2021, ISBN: 979-8450959283

Reference Books:

1. Ball, M., 2022, —The Metaverse and How It Will Revolutionize Everything—, Liveright, ISBN: 978- 1324092032
2. Damar, M. (2021). Metaverse shape of your life for future: A bibliometric snapshot. Journal ofMetaverse, 1(1), 1–8.
3. Day, J. (2022) Metaverse will see cyber warfare attacks unlike anything before: 'Massively elevated', February 28.
    a. https://www.express.co.uk/news/science/1570844/metaverse-news-cyber- warfare-attacks-virtual-worlds-russia-china-spt.
4. Polyviou, A., Sharma K., Pappas, I.O.(2023). Training in the metaverse: Employing physiological data to improve how we build metaverses for businesses. The next generation internet: The role of metaverses, AR, VR, MR, and digital twins, Temple University Institute for Business and Information Technology Link: https://ibit.temple.edu/nextgenerationinternet
5. QuHarrison T. , Keeney, S., 2022, —The Metaverse Handbook: Innovating for the Internet's NextTectonic Shift‖, Wiley, ISBN: 978-1119892526
6. The mistocleous, M., Christodoulou, K., & Katelaris, L. (2023). An Educational

Metaverse Experiment: The first on-chain and in- Metaverse academic course. Information Systems. EMCIS2022. Lecture Notes in Business Information Processing, Springer, Cham.

7. Stephenson, N., 1992, —Snow Crash‖, ISBN: 978-055338

IV B.Tech I Semester
PROFESSIONAL ELECTIVE-V

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VII Sem	COMPUTER VISION							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05702c	3	0	0	42	3	30	70	100

Course Objectives:

The objective of this course is to understand the basic issues in computer vision and major approaches to address the methods to learn the Linear Filters, segmentation by clustering, Edge detection, Texture.

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

CO1	Identify basic concepts, terminology, theories, models and methods in the field of computer vision
CO2	Describe known principles of human visual system
CO3	Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition
CO4	Suggest a design of a computer vision system for a specific problem

COURSE CONTENT		
MODULE – 1	**Linear Filters**	**8H**
Introduction to Computer Vision, Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing Filters as Templates, Technique: Normalized Correlation and Finding Patterns, Technique: Scale and Image Pyramids.		
MODULE – 2	**Edge Detection**	**9H**
Noise- Additive Stationary Gaussian Noise, Why Finite Differences Respond to Noise, Estimating Derivatives - Derivative of Gaussian Filters, Why Smoothing Helps, Choosing a Smoothing Filter, Why Smooth with a Gaussian? Detecting Edges-Using the Lap lacian to Detect Edges, Gradient-Based Edge Detectors, Technique: Orientation Representations and Corners.		
MODULE – 3	**Texture**	**9H**
Representing Texture –Extracting Image Structure with Filter Banks, Representing Texture using the Statistics of Filter Outputs, Analysis (and Synthesis) Using Oriented Pyramids –The Lap lacian Pyramid, Filters in the Spatial Frequency Domain, Oriented Pyramids, Application: Synthesizing Textures for Rendering, Homogeneity, Synthesis by Sampling Local Models, Shape from Texture, Shape from Texture for Planes		
MODULE – 4	**Segmentation By Clustering**	**8H**
What is Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction. Image Segmentation by Clustering Pixels, Segmentation by Graph- Theoretic Clustering. The Hough Transform, Fitting Lines, Fitting Curves		
MODULE – 5	**Recognization By Relations Between Templates**	**8H**
Finding Objects by Voting on Relations between Templates, Relational Reasoning Using Probabilistic Models and Search, Using Classifiers to Prune Search, Hidden Markov Models, Application: HMM and Sign Language Understanding, Finding People with HMM.		
	Total hours:	**42 hours**

Text books:

1. David A. Forsyth, Jean Ponce, Computer Vision – A modern Approach, PHI, 2003.

Reference Books:

1. Geometric Computing with Clifford Algebras: Theoretical Foundations and Applications in Computer Vision and Robotics, Springer;1 edition,2001by Sommer.
2. Digital Image Processing and Computer Vision,1/e, by Sonka.
3. Computer Vision and Applications: Concise Edition (With CD) by Jack Academy Press, 2000.

Online Learning Resources:

https://nptel.ac.in/courses/106105216https://nptel.ac.in/courses/108103174

IV B.Tech I Semester
PROFESSIONAL ELECTIVE-V

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VII Sem	CYBER PHYSICAL SYSTEMS							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05702d	3	0	0	48	3	30	70	100

Course Objective:

The objective of this course is to provide students with a comprehensive understanding of the various techniques and methodologies used to design, secure, synchronize, and schedule operations within **Cyber- Physical Systems (CPS)**. The course will cover symbolic synthesis for CPS, security aspects, distributed synchronization, real-time scheduling, and model integration, with an emphasis on both basic principles and advanced techniques.

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

CO1	Understand the core principles behind CPS
CO2	Identify Security mechanisms of Cyber physical systems
CO3	Understand Synchronization in Distributed Cyber-Physical Systems
CO4	To Understand the Scheduling for Cyber-Physical Systems
CO5	To understand the various Cyber-Physical System models

COURSE CONTENT		
MODULE – 1	**Symbolic Synthesis for Cyber-Physical Systems**	**9H**
Introduction and Motivation, Basic Techniques - Preliminaries, Problem Definition, Solving the Synthesis Problem, Construction of Symbolic Models, Advanced Techniques: Construction of Symbolic Models, Continuous-Time Controllers, Software Tools		
MODULE – 2	**Security of Cyber-Physical Systems**	**10H**
Introduction and Motivation, Basic Techniques - Cyber Security Requirements, Attack Model, Countermeasures, Advanced Techniques: System Theoretic Approaches.		
MODULE – 3	**Synchronization in Distributed Cyber-Physical Systems**	**9H**
Challenges in Cyber-Physical Systems, A Complexity-Reducing Technique for Synchronization, Formal Software Engineering, Distributed Consensus Algorithms, Synchronous Lockstep Executions, Time-Triggered Architecture, Related Technology, Advanced Techniques		
MODULE – 4	**Real-Time Scheduling for Cyber-Physical Systems**	**10H**
Introduction and Motivation, Basic Techniques - Scheduling with Fixed Timing Parameters, Memory Effects, Multiprocessor/Multicore Scheduling, Accommodating Variability and Uncertainty		
MODULE – 5	**Model Integration in Cyber-Physical Systems**	**10H**
Introduction and Motivation, Causality, Semantic Domains for Time, Interaction Models for Computational Processes, Semantics of CPS DSMLs, Advanced Techniques, For Spec, The Syntax of CyPhyML, Formalization of Semantics, Formalization of Language Integration.		
	Total hours:	**48hours**

Text Books:

1. Raj Raj kumar, Dion is io De Niz, and Mark Klein, Cyber-Physical Systems, Addison- Wesley Professional.
2. Rajeev Alur, Principles of Cyber-Physical Systems, MIT Press, 2015

References

1. **Raj Rajkumar, Dionisio De Niz, and Mark Klein, Cyber-Physical Systems, Addison-Wesley Professional, 2016. ISBN: 978-0133970178.**
2. **Rajeev Alur, Principles of Cyber-Physical Systems, MIT Press, 2015. ISBN: 978-0262029117.**

IV B.Tech I Semester

<table>
<tr><td colspan="8">NARAYANA ENGINEERING COLLEGE :: GUDUR</td></tr>
<tr><td>VII Sem</td><td colspan="6">PROMPT ENGINEERING
Skill Enhancement Course</td><td>R23</td></tr>
<tr><td rowspan="2">Course Code</td><td colspan="3">Hours / Week</td><td rowspan="2">Total hrs</td><td>Credit</td><td colspan="2">Max Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>TOTAL</td></tr>
<tr><td>23A05703</td><td>0</td><td>1</td><td>2</td><td>42</td><td>2</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="8">Course Objective:
This course delves into prompt engineering principles, strategies, and best practices, a crucial aspect in shaping AI models' behaviour and performance. Understanding Prompt Engineering is a comprehensive course designed to equip learners with the knowledge and skills to effectively generate and utilize prompts in natural language processing (NLP) and machine learning (ML) applications. This course delves into prompt engineering principles, strategies, and best practices, a crucial aspect in shaping AI models' behaviour and performance.</td></tr>
<tr><td colspan="8">Course Outcomes: After completion of the course, students will be able to</td></tr>
<tr><td>CO1</td><td colspan="7">Under standing the fundamentals and evolution of prompt engineering.</td></tr>
<tr><td>CO2</td><td colspan="7">Gaining the ability to craft effective closed-ended, open-ended, and role-based prompts.</td></tr>
<tr><td>CO3</td><td colspan="7">Learning to probe and stress-test AI models for bias and robustness.</td></tr>
<tr><td>CO4</td><td colspan="7">Applying prompt optimization techniques and performance evaluation methods.</td></tr>
<tr><td>CO5</td><td colspan="7">Mitigating bias and promoting ethical prompting practices in NLP/ML systems.</td></tr>
</table>

COURSE CONTENT		
MODULE – 1	**Introduction to Prompt Engineering**	**7H**
• Lesson 1: Foundations of Prompt Engineering o Overview of prompt engineering and its significance in NLP and ML. o Historical context and evolution of prompt-based approaches.		
MODULE – 2	**Types of Prompts and Their Applications**	**7H**
• Lesson 2: Closed-Ended Prompts o Under standing and creating prompts for specific answers. o Applications in question- answering systems. • Lesson 3: Open-Ended Prompts o Crafting prompts for creative responses. o Applications in language generation models.		
MODULE – 3	**Strategies for Effective Prompting**	**7H**
• Lesson 4: Probing Prompts o Designing prompts to reveal model biases. o Ethical considerations in using probing prompts. • Lesson 5: Adversarial Prompts o Creating prompts to stress-test models. o Enhancing robustness through adversarial prompting.		
MODULE – 4	**Fine-Tuning and Optimizing with Prompts**	**7H**
• Lesson 6: Fine-Tuning Models with Prompts o Techniques for incorporating prompts during model training. o Balancing prompt influence and generalization. • Lesson 7: Optimizing Prompt Selection o Methods for selecting optimal prompts for specific tasks. o Customizing prompts based on model behavior.		
MODULE – 5	**Evaluation and Bias Mitigation**	**7H**
• Lesson 8: Evaluating Prompt Performance o Metrics and methodologies for assessing model performance with prompts. o Interpreting and analyzing results. • Lesson 9: Bias Mitigation in Prompt Engineering o Strategies to identify and address biases introduced by prompts. o Ensuring fairness and inclusivity in prompt-based models.		
MODULE – 6	**Real-World Applications and Case Studies**	**7H**
• Lesson 10: Case Studies in Prompt Engineering • Exploration of successful implementations and challenges in real-world scenarios. • Guest lectures from industry experts sharing their experiences.		
	Total hours:	**42 hours**

Text books:

1. "Prompt Engineering in Action" – Danny D. Sullivan
2. "The Art of Prompt Engineering with Chat GPT: A Hands-On Guide" – Nathan Hunter.

Reference Books:

1. "Prompt Engineering in Practice" – Michael F. Lewis
2. "Mastering AI Prompt Engineering: The Ultimate Guide for Chat GPT Users" – Adriano Damiao
3. "Writing AI Prompts For Dummies" – Stephanie Diamond and Jeffrey Allan
4. "Prompt Engineering Guide" (Online Resource) – promptingguide.ai

Online Resource link :

https://www.udemy.com/course/understanding-prompt-engineering/?couponCode=NVDINCTA35TRT

IV B.Tech I Semester

NARAYANA ENGINEERING COLLEGE :: GUDUR								
VII Sem	GENDER SENSITIZATION							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	2	0	0	44	0	30	70	100

Course Objectives:

- To enable students to understand the gender related issues, vulnerability of women and men
- To familiarize them about constitutional safeguard for gender equality
- To expose the students to debates on the politics and economics of work
- To help students reflect critically on gender violence
- To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.

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

CO1	Understand the basic concepts of gender and its related terminology
CO2	Identify the biological, sociological, psychological and legal aspects of gender.
CO3	Use the knowledge in understanding how gender discrimination works in our society and how to counter it.
CO4	Analyzethe gendered division of labour and its relation to politics and economics.
CO5	Appraise how gender-role beliefs and sharing behaviour are associated with more well-being in all culture and gender groups
CO6	Develop students‘ sensibility with regard to issues of gender in contemporary India

COURSE CONTENT		
MODULE – 1	**UNDERSTANDING GENDER**	**9H**
Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.		
MODULE – 2	**GENDER ROLES AND RELATIONS**	**9H**
Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences-Declining Sex Ratio- Demographic Consequences-Gender Spectrum		
MODULE – 3	**GENDER AND LABOUR**	**8H**
Division and Valuation of Labour-Housework: The Invisible Labor- ―My Mother doesn‘t Work.‖ ―Share the Load.‖-Work: Its Politics and Economics -Fact and Fiction- Unrecognized and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming		
MODULE – 4	**GENDER-BASED VIOLENCE**	**8H**
The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence		
MODULE – 5	**GENDER AND CULTURE**	**10H**
Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language- Just Relationships		
	Total hours:	**44 hours**

Text Books:

1. A.Suneetha, Uma Bhrugubanda, et al. Towards a World of Equals: A Bilingual Textbook on Gender‖, Telugu Akademi, Telangana, 2015.
2. Butler, Judith. Gender Trouble: Feminism and the Subversion of Identity. UK Paperback Edn. March 1990

Reference Books

1. Wtatt, Robin and Massood, Nazia, Broken Mirrors: The dowry Problems in India,London : Sage Publications, 2011
2. Datt, R. and Kornberg, J.(eds), Women in Developing Countries, Assessing Strategies for Empowerment, London: Lynne Rienner Publishers, 2002
3. Brush, Lisa D., Gender and Governance, New Delhi, Rawat Publication, 2007
4. Singh, Direeti, Women and Politics World Wide, New Delhi, Axis Publications, 2010
5. Raj Pal Singh, Anupama Sihag, Gender Sensitization: Issues and Challenges

(English, Hardcover), Raj Publications, 2019

6. A.Revathy& Murali, Nandini, A Life in Trans Activism(Lakshmi Narayan Tripathi). The University of Chicago Press, 2016

Online Resources:

1. Understanding Gender

chrome-extension://kdpelmjpfafjppnhbloffcjpeomlnpah/https://www.arvindguptatoys.com/arvindgupta/ kamla-gender1.pdf

https://onlinecourses.swayam2.ac.in/nou24_hs53/preview

Gender Roles and Relations
https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are- gender-roles-and-stereotypes

https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our- relationships-7499408

https://onlinecourses.swayam2.ac.in/cec23_hs29/preview

2. Gender and Labour

https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and- how-can-it-be-redressed

https://onlinecourses.nptel.ac.in/noc23_mg67/preview

3. **GENDER-BASED VIOLENCE**
https://eige.europa.eu/gender-based-violence/what-is-gender-based-violence?language_content_entity=en

https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and- girls

https://onlinecourses.swayam2.ac.in/nou25_ge38/preview

4. **GENDER AND CULTURE**
https://gender.study/psychology-of-gender/culture-impact-gender-

roles-identities/ https://sociology.iresearchnet.com/sociology-of-

culture/gender-and-culture/

https://archive.nptel.ac.in/courses/109/106/109106136/

5. Abdulali Sohaila. —I Fought For My Life…and Won.‖ Available online (at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

OPEN ELECTIVES R23

THE OPEN ELECTIVES

Open Elective courses (R23) provide students the flexibility to explore interdisciplinary subjects beyond their core domain. These electives enhance technical breadth, support career specialization, and promote innovation.

Open Elective-1 (III-I)	Open Elective-2 (III-II)	Open Elective-3 (IV-I)	Open Elective-4 (IV-I)
JAVA PROGRAMMING	OPERATING SYSTEMS	DATABASE MANAGEMENT SYSTEMS	COMPUTER NETWORKS
FUNDAMENTALS TO ARTIFICIAL INTELLIGENCE	MACHINE LEARNING	CYBER SECURITY	INTERNET OF THINGS

III B.Tech I Semester
OPEN ELECTIVE-1

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	JAVA PROGRAMMING							R23
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A05505a	3	0	0	45	3	30	70	100

Course Objectives: The main objective of the course is to

- Identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception
- handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java apis for program development

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

CO1	Analyze problems, design solutions using OOP principles, and implement them efficiently in Java
CO2	Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects
CO3	Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch
CO4	Apply Competence in handling exceptions and errors to write robust and fault-tolerant code
CO5	Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.
CO6	Choose appropriate data structure of Java to solve a problem

COURSE CONTENT		
MODULE – 1		**9H**

Object Oriented Programming: Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style. Data Types

Variables, and Operators : Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, **Introduction to Operators**, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

MODULE – 2		**9H**

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

MODULE – 3		**9H**

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two- dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

MODULE – 4		9H

Packages and Java Library : Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java. lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto un boxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java. .Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throw able, Unchecked Exceptions, Checked Exceptions.

MODULE – 5		9H

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter thread Communication - Suspending, Resuming, and Stopping of Threads. Java Database Connectivity: Introduction, JDBC Architecture, Installing My SQL and My SQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface

Total hours:	**45hours**

Text Books:

1. JAVA one step ahead, Anitha Seth, B.L. Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object-Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

Reference Books:

1. The complete Reference Java, 11thedition, Herbert Schildt,TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Learning Resources:

https://nptel.ac.in/courses/106/105/106105191/

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

III B.Tech I Semester
OPEN ELECTIVE-1

<table>
<tr><td colspan="8">NARAYANA ENGINEERING COLLEGE :: GUDUR</td></tr>
<tr><td>V SEM</td><td colspan="6">FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE</td><td>R23</td></tr>
<tr><td rowspan="2">Course Code</td><td colspan="3">Hours / Week</td><td rowspan="2">Total hrs</td><td>Credit</td><td colspan="2">Max Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CIE</td><td>SEE</td><td>TOTAL</td></tr>
<tr><td></td><td>3</td><td>0</td><td>0</td><td>43</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="8">Course Objectives:
• To learn the distinction between optimal reasoning Vs. human like reasoning.
• To understand the concepts of state space representation, exhaustive search, heuristic
• search together with the time and space complexities.
• To learn different knowledge representation techniques.
• To understand the applications of AI, namely game playing, theorem proving, and machine learning.</td></tr>
<tr><td colspan="8">Course Outcomes: After completion of the course, students will be able to</td></tr>
<tr><td>CO1</td><td colspan="7">Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.</td></tr>
<tr><td>CO2</td><td colspan="7">Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.</td></tr>
<tr><td>CO3</td><td colspan="7">Learn different knowledge representation techniques.</td></tr>
<tr><td>CO4</td><td colspan="7">Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.</td></tr>
<tr><td>CO5</td><td colspan="7">Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.</td></tr>
<tr><td>CO6</td><td colspan="7">Analyze Supervised Learning Vs. Learning Decision Trees</td></tr>
</table>

COURSE CONTENT		
MODULE – 1	**Introduction to AI**	**9H**
Introduction to AI - Intelligent Agents, Problem-Solving Agents, **Searching for Solutions** - Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.		
MODULE – 2	**Games & Logic**	**8H**
Games - Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, **Logic-** Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.		
MODULE – 3	**First-Order Logic & Knowledge Representation**	**8H**
First-Order Logic - Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution. **Knowledge Representation:** Ontological Engineering, Categories and Objects, Events.		
MODULE – 4	**Planning**	**9H**
Planning - Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.		
MODULE – 5	**Probabilistic Reasoning**	**9H**
Probabilistic Reasoning:Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability.		
	Total hours:	**43hours**

Text Book:

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

Reference Books:

7. Artificial Intelligence, 3rd Edn., E. Rich and K. Knight (TMH)
8. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
9. Artificial Intelligence, Shivani Goel, Pearson Education.
10. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

III B.Tech II Semester
OPEN ELECTIVE-II

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	OPERATING SYSTEMS							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	0	0	42	3	30	70	100

Course Objectives: The main objectives of the course is to make student

6. Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
7. Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
8. Illustrate different conditions for deadlock and their possible solutions.

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

CO1	Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication
CO2	Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection.
CO3	Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
CO4	Illustrate different conditions for deadlock and their possible solutions. (L2)
CO5	Analyze the memory management and its allocation policies.
CO6	Able to design and implement file systems, focusing on file access methods, directory structure, free space management, and also explore various protection mechanisms

COURSE CONTENT		
MODULE – 1	**8086 Architecture**	**8H**
Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems **System Structures:** Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging		
MODULE – 2	**Processes, Threads and Concurrency & CPU Scheduling**	**9H**
Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication. **Threads and Concurrency:** Multithreading models, Thread libraries, Threading issues. **CPU Scheduling:** Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.		
MODULE – 3	**Synchronization Tools & Deadlocks**	**8H**
Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization. **Deadlocks:** system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.		
MODULE – 4	**Memory- Management Strategies**	**9H**
Memory- Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping. **Virtual Memory Management:** Introduction, Demand paging, Copy-on- write, Page replacement, Allocation of frames, Thrashing. **Storage Management:** Overview of Mass Storage Structure, HDD Scheduling.		
MODULE – 5	**File System & rotection**	**8H**
File System: File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File System Mounting, Partitions and Mounting, File Sharing. **Protection:** Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.		
	Total hours:	**42 hours**

Text books:

1. Operating System Concepts, Silber schatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson , 2016

References:

1. Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018
2. Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition, McGraw- Hill, 2013

Online Learning Resources:

1. https://nptel.ac.in/courses/106/106/106106144/
2. **http://peterindia.net/OperatingSystems.html**

III B.Tech II Semester
OPEN ELECTIVE-II

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	MACHINE LEARNING							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	0	0	47	3	30	70	100

Course Objectives:

The course is introduced for students to

- Understand basic concepts of Machine Learning
- Study different learning algorithms
- Illustrate evaluation of learning algorithms

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

CO1	Identify machine learning techniques suitable for a given problem
CO2	Solve the problems using various machine learning techniques
CO3	Design application using machine learning techniques
CO4	To understand and explore Supervised Learning techniques
CO5	To understand and explore unsupervised learning techniques

COURSE CONTENT		
MODULE – 1	**Introduction to Machine Learning & Preparing to Model**	**9H**
Introduction: What is Human Learning? Types of Human Learning, what is Machine Learning? Types of Machine Learning, Problems Not to Be Solved Using Machine Learning, Applications of Machine Learning, State-of-The-Art Languages/Tools in Machine Learning, Issues in Machine Learning Preparing to Model: Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing		
MODULE – 2	**Modelling and Evaluation &Basics of Feature Engineering**	**9H**
Introduction, selecting a Model, training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a Model Basics of Feature Engineering: Introduction, Feature Transformation, Feature Subset Selection		
MODULE – 3	**Bayesian Concept Learning & Supervised Learning: Classification**	**10H**
Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network. Supervised Learning: Classification: Introduction, Example of Supervised Learning, Classification Model, Classification Learning Steps, Common Classification Algorithms-k-Nearest Neighbour(kNN), Decision tree, Random forest model, Support vector machines		
MODULE – 4	**Supervised Learning: Regression**	**10H**
Introduction, Example of Regression, Common Regression Algorithms-Simple linear regression, Multiple linear regression, Assumptions in Regression Analysis, Main Problems in Regression Analysis, Improving Accuracy of the Linear Regression Model, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.		
MODULE – 5	**Unsupervised Learning**	**9H**
Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning, Clustering – Clustering as a machine learning task, Different types of clustering techniques, Partitioning methods, K- Medoids: a representative object-based technique, Hierarchical clustering, Density-based methods- DBSCAN Finding Pattern using Association Rule- Definition of common terms, Association rule, The apriori algorithm for association rule learning, Build the apriori principle rules		
	Total hours:	**47 hours**

Text Book:

Machine Learning, Saik at Dutt, Subramanian Chandra mouli, Amit Kumar Das, Pearson, 2019.

References:

1. Ethern Alpaydin, ―Introduction to Machine Learning‖, MIT Press, 2004.
2. Stephen Marsland, ―Machine Learning -An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
3. Andreas C. Müller and Sarah Guido ―Introduction to Machine Learning with Python: A Guide for Data Scientists‖, Oreilly.

Online Learning Resources:

- Andrew Ng, ―Machine Learning B.Techning‖ https://www.deeplearning.ai/machine-learning- B.Techning/
- Shai Shalev-Shwartz, ShaiBen-David, ―Understanding Machine Learning: From Theory to Algorithms‖ , Cambridge University Press

  https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

IV B.Tech I Semester
OPEN ELECTIVE- III

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	DATABASE MANAGEMENT SYSTEMS							R23
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	3	0	0	43	3	30	70	100

Course Objectives: The main objective of the course is to

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques
- To learn the domain testing, path testing and logic based testing to explore the testing process easier.

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

CO1	Understand the basic concepts of database management systems
CO2	Analyze a given database application scenario to use ER model for conceptual design of the database
CO3	Utilize SQL proficiently to address diverse query challenges
CO4	Employ normalization methods to enhance database structure
CO5	Assess and implement transaction processing, concurrency control and database recovery protocols in databases.

COURSE CONTENT		
MODULE – 1	**Introduction**	**9H**
Introduction: Data base system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database. **Entity Relationship Model:** Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.		
MODULE – 2	**Relational Model**	**8H**
Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Data base schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).		
MODULE – 3	**SQL**	**8H**
SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.		
MODULE – 4	**Schema Refinement (Normalization):**	**9H**
Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce- Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).		
MODULE – 5	**Transaction Concept**	**9H**
Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, Time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm. **Introduction to Indexing Techniques:** B+ Trees, operations on B+Trees, Hash Based Indexing		
	Total hours:	**43 hours**

Text Books

1. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

References Books:

1. Introduction to Database Systems, 8thedition, C J Date, Pearson.
2. Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Online Learning Resources:

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0127580666728202 2456_shared/overview

IV B.Tech I Semester
OPEN ELECTIVE- III

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	CYBER SECURITY							R23
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	3	0	0	42	3	30	70	100

Course Objectives:

The course is designed to provide awareness on different cyber crimes, cyber offenses, tools and methods used in cybercrime.

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

CO1	Classify the cybercrimes and understand the Indian ITA 2000
CO2	Analyse the vulnerabilities in any computing system and find the solutions
CO3	Predict the security threats of the future
CO4	Investigate the protection mechanisms
CO5	Design security solutions for organizations

COURSE CONTENT		
MODULE – 1	**Introduction to Cybercrime**	**8H**
Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.		
MODULE – 2	**Cyber Offenses: How Criminals Plan Them**	**9H**
Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing		
MODULE – 3	**Cybercrime: Mobile and Wireless Devices**	**9H**
Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.		
MODULE – 4	**Tools and Methods Used in Cybercrime**	**8H**
Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares,Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.		
MODULE – 5	**Cyber Security: Organizational Implications**	**8H**
Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.		
	Total hours:	**42 hours**

Text books:

2. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

Reference Books:

3. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

4. Introduction to Cyber Security, Chwan- Hwa(john) Wu,J. David Irwin.CRC Press T&F

Group

Online Learning Resources:

http://nptel.ac.in/courses/106105031/40
http://nptel.ac.in/courses/106105031/39
http://nptel.ac.in/courses/106105031/38

IV B.Tech I Semester
OPEN ELECTIVE- IV

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	COMPUTER NETWORKS							R23
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	3	0	0	45	3	30	70	100

Course Objectives:

The course is designed to

- Understand the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP
- Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

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

CO1	Identify the software and hardware components of a computer network
CO2	Design software for a computer network
CO3	Develop new routing, and congestion control algorithms
CO4	Assess critically the existing routing protocols
CO5	Explain the functionality of each layer of a computer network
CO6	Choose the appropriate transport protocol based on the application requirements

COURSE CONTENT		
MODULE – 1	**Computer Networks and the Internet**	**8H**
What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packe Switched Networks(Textbook 2), Reference Models, Example Networks, Guided Transmission Media, Wireless Transmission(Textbook 1)		
MODULE – 2	**The Data Link Layer, Access Networks, and LANs**	**9H**
Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1) Introduction to the Link Layer, Error-Detection and - Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request (Textbook 2)		
MODULE – 3	**The Network Layer**	**8H**
Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1)		
MODULE – 4	**The Transport Layer**	**10H**
Connectionless Transport: UDP (Textbook 2), The Internet Transport Protocols: TCP, Congestion Control (Textbook 1)		
MODULE – 5	**Principles of Network Applications**	**10H**
Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks (Textbook 2)		
	Total hours:	**45 hours**

Text books:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, ―Computer Networking: A Top-Down Approach‖, 6th edition, Pearson, 2019.

Reference Books:

1. Forouzan, Data communications and Networking, 5th Edition, Mc Graw Hill Publication.
2. Youlu Zheng, Shakil Akthar, ―Networks for Computer Scientists and Engineers‖, Oxford Publishers, 2016.

Online Learning Resources:

https://nptel.ac.in/courses/106105183/25

http://www.nptelvideos.in/2012/11/computer-networks.html

https://nptel.ac.in/courses/106105183/3

IV B.Tech I Semester
OPEN ELECTIVE- IV

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	INTERNET OF THINGS							R23
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
	3	0	0	43	3	30	70	100

Course Objectives:

6. Understand the basics of Internet of Things and protocols.
7. Discuss the requirement of IoT technology
8. Introduce some of the application areas where IoT can be applied.
9. Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management.

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

CO1	Understand general concepts of Internet of Things.
CO2	Apply design concept to IoT solutions
CO3	Analyze various M2M and IoT architectures
CO4	Evaluate design issues in IoT applications
CO5	Create IoT solutions using sensors, actuators and Devices

COURSE CONTENT		
MODULE – 1	**Introduction to IoT**	**8H**
Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates		
MODULE – 2	**Prototyping IoT Objects using Microprocessor/Microcontroller**	**9H**
Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.		
MODULE – 3	**IoT Architecture and Protocols**	**8H**
Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.		
MODULE – 4	**Device Discovery and Cloud Services for IoT**	**8H**
Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.		
MODULE – 5	**UAV IoT**	**10H**
Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software – Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study Flyt Base.		
	Total hours:	**43 hours**

Text books:

1. Vijay Madisetti and Arshdeep Bahga, ― Internet of Things (A Hands-on-Approach)‖, 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis; George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.

References:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, ― From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis daCosta, ―Rethinking the Internet of Things: A Scalable Approach to Connecting Everything‖, 1st Edition, Apress Publications, 2013
5. Cuno Pfister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 9781- 4493- 9357-1
6. DGCA RPAS Guidance Manual, Revision 3 – 2020
7. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal

Online Learning Resources:

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5
4. https://nptel.ac.in/courses/108108098/4

HONORS

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	QUANTUM COMPUTING							R23
Course Code	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
23A05H01	3	0	0	44	3	30	70	100

Course Objectives

- To introduce the principles and mathematical foundations of quantum computation.
- To understand quantum gates, circuits, and computation models.
- To explore quantum algorithms and their advantages over classical ones.
- To develop the ability to simulate and write basic quantum programs.
- To understand real-world applications and the future of quantum computing in AI, cryptography, and optimization.

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

CO1	Explain the fundamental concepts of quantum mechanics used in computing.
CO2	Construct and analyze quantum circuits using standard gates.
CO3	Apply quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's.
CO4	Develop simple quantum programs using Qiskit or similar platforms.
CO5	Analyze applications and challenges of quantum computing in real-world domains.

COURSE CONTENT		
MODULE – 1	**Fundamentals of Quantum Mechanics and Linear Algebra**	**9H**
Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems.		
MODULE – 2	**Quantum Gates and Circuits**	**9H**
Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits.		
MODULE – 3	**Quantum Algorithms and Complexity**	**9H**
Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover's Search Algorithm, Shor's Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA.		
MODULE – 4	*Quantum Programming and Simulation Platforms*	**8H**
Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware.		
MODULE – 5	**Applications and Future of Quantum Computing**	**9H**
Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions.		
	Total hours:	**44 hours**

Text Books:

1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.

Reference Books:

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.

Online Learning Resources:

1. **IBM Quantum Experience and Qiskit Tutorials**
2. **Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley**

3. edX – The Quantum Internet and Quantum Computers
4. **YouTube – Quantum Computing for the Determined by Michael Nielsen**
5. Qiskit Textbook – IBM Quantum

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	No SQL DATABASES							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05H02	3	0	0	60	3	30	70	100

Course Objectives:

- Discuss the history unstructured data
- To know non- relational databases and their importance in Data science.
- Understand the differences between Relational and No SQL databases
- To explore the several types of No SQL data bases and understand the role in Big Data.

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

CO1	Explain and compare different types of No SQL database.
CO2	Compare and contrast RDBMS with different No SQL databases.
CO3	Define, compare and use the four types of No SQL databases (Document-oriented, Key Value pairs, Column-oriented and Graph
CO4	Demonstrate the architecture, define objects, load data, query data and performance tune Column-oriented, Key-Value pair, Document and Graph databases.
CO5	Evaluate No SQL database development tools and programming languages

COURSE CONTENT		
MODULE – 1	**Overview and history of No SQL Data bases**	**12H**
Definition of the four types of No SQL data bases. The value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The emergence of No SQL, Key Points.		
MODULE – 2	**RDBMS Vs No SQL**	**12H**
Comparison of relational databases to new No SQL stores, Mongo DB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges No SQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregated-Oriented Databases, Replication and Sharding, Map Reduce on databases, Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.		
MODULE – 3	**Document Data bases**	**12H**
No-SQL Key-Value Databases using Mongo DB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analysis or Real Time Analytics.		
MODULE – 4	**Column Oriented Databases**	**12H**
Column-oriented No SQL databases using Apache HBASE, Column-oriented No SQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.		
MODULE – 5	**Key Value Data bases**	**12H**
No SQL Key-Value databases using Riak, Key-Value Data bases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets, Firebase- Cloud hosted No SQL Database, Graph No SQL databases using Neo4j, No SQL database development tools and programming languages, Graph Databases features, consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.		
	Total hours:	**60 hours**

Text Book:

1. Sadalage, P. & Fowler, No SQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition 2019.

Reference Books:

1. Redmond, E. & Wilson, J. (2012). Seven Databases in Seven Weeks: A Guide to Modern Databases and the No SQL Movement (1st Ed.). Raleigh, NC: The Pragmatic Programmers, LLC.
   ISBN-13: 978-1934356920 ISBN-10: 1934356921
2. Guy Harrison, Next Generation Database: No SQL and big data, Apress.

Online Learning Resources:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-databa

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	SOFTWARE DEFINED DATA CENTER							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05H03	3	0	0	60	3	30	70	100

Course Objectives:

- Introduce conventional Data Centers followed by Modern Data Centers
- To discuss various software elements of modern data centers
- Explain Virtualization concepts for Data Centers
- Discuss Compute, Storage and Network virtualization

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

CO1	Understanding of difference between Conventional Data Center Vs Modern Data Centers
CO2	Differentiate Cloud computing and Software Defined Data Centers
CO3	Differentiate Virtualization with conventional techniques
CO4	Explore the techniques of Software Defined Compute, Storage and Networking components
CO5	Able Manage Software Defined Data Centers and Develop the techniques for future Data Centers.

COURSE CONTENT		
MODULE – 1	**Introduction**	**12H**
Data Center evolution, A history of Modern Data Center, Focus on cost reduction, Focus on Customer service in the business, Flattening of the IT organization, IT as an operational Expense, Monolithic Storage Array rise and fall, Move From Disk to Flash, Emergence of Convergence, The Role of Cloud computing		
MODULE – 2	**Emerging Data Center Trends**	**12H**
Emergence of SDCC, Commoditization of Hardware, Software Defined – Compute, Storage, Networking and Security, Software Defined Storage (SDS), Hyper convergence, Hyper Converged Infrastructure(HCI) and SDS relationship, Flash in Hyper convergence, Modern IT business Requirements.		
MODULE – 3	**Data Center Agility**	**12H**
Principles and Strategies, Transform Data Center, Align Data Center and Business Needs, Server virtualization, VDI, Eliminate and Implement Monolithic to Hyper convergence, Full Stack Management.		
MODULE – 4	**Hyper converged Infrastructure**	**12H**
Software Defined Storage, SDS comparison to Traditional Storage, SDS requirements, SDS in Hyper converged, Hyper convergence Design Model, Virtual Storage appliances, Appliance vs. Software / Reference Architecture,		
MODULE – 5	**Future Data Centers**	**12H**
Data growth, Storage capacity, flash storage deployment, Deployment Experiences SDS and HCI, IT transformations- Automation, Orchestration, Dev Ops, Open Standards and Interoperability, Performance Benchmarking Standards, Future Trends, Containers Instead of virtual machines, Open Source tools, Beyond Today's Flash, Pooling of Resources.		
	Total hours:	**60 hours**

Text books:

1. Building a Modern Data Center, Principles and Strategies of Design, Scott D.Lowe, James Green, David Davis. Actual Tech Media, 2016.

References:

1. Data Center Handbook: Plan, Design, Build, and Operations of a Smart Data Center, Second Edition, HwaiyuGeng P.E.,2021 John Wiley & Sons.

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	ROBOTICS AND INTELLIGENT SYSTEMS							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	0	0	42	3	30	70	100

Course Objectives:

- Understand the basic concepts of robotics.
- Discuss the requirement of robotic technology
- Introduce robotics kinematics, dynamic analysis and programming.
- Understand the concepts of intelligent system and apply them to robotics

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

CO1	Understand general concepts of Robotics and intelligent systems.
CO2	Understand robotics control systems
CO3	Analyze and understand the various programming languages of robotics
CO4	Understand Industrial robots and its applications
CO5	Create IoT solutions using sensors, actuators and Devices

COURSE CONTENT		
MODULE – 1	**Introduction to Robotics**	**8H**
Back ground, Historical development, Robot Arm Kinematics and Dynamics, Manipulator Trajectory planning and Motion Control, Robot Sensing		
MODULE – 2	**Robot Arm Kinematics and Dynamics**	**9H**
Introduction to Kinematics, Direct and Inverse Kinematics Problem and solution, Dynamics introduction, Lagrange-Euler Formulation, Newton Euler Formation, Generalized D'Alembert Equations of motion. Trajectory planning		
MODULE – 3	**Sensing and Vision**	**9H**
Introduction to Sensing, Proximity Sensing, Touch Sensors, Force and Torque Sensing, Image acquisition, Illumination techniques, Imaging Geometry, Recognition and Interpretation.		
MODULE – 4	**Robot Programming Languages**	**8H**
Introduction to Robot Programming Languages, Characteristics of Robot Level Languages, three levels of robot programming, requirements of a robot programming language, Task Level Languages, problems peculiar to robot languages, Introduction to Robot Operating System (ROS)		
MODULE – 5	**Robot Intelligence**	**8H**
Introduction, State Space Search, Problem Reduction, Use of Predicate Logic, Means-Ends Analysis, Problem solving, Robot Learning, Robot Task Planning, Basic Problems in Task Planning, Expert systems and knowledge engineering.		
	Total hours:	**42 hours**

Text Book:

1. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, Robotics : Control, Sensing, Vision and Intelligence
2. Aaron Martinez, Enrique Fernandez, Learning ROS for Robotics Programming: A practical, instructive, and comprehensive guide to introduce your self to ROS, the top-notch, leading robotics framework, PACKT publishing, Open Source.

References:

John J. Craig, Introduction to Robotics: Mechanics and Control, Addison Wesley publication, Third Edition.

Online Learning Resources:

https://nptel.ac.in/courses/107106090

https://nptel.ac.in/courses/112108298

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	CLOUD SECURITY							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	0	0	45	3	30	70	100

Pre- requisites: Computer Networks, Cryptography and Network Security, Cloud Computing.

Course Objectives:

The course is designed to

- Understand the cloud security and privacy issues.
- Familiarize with the Threat Model and Cloud Attacks.
- Understand the Data Security and Storage.
- Analyze Security Management in the Cloud

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

CO1	Distinguish the various cloud security and privacy issues.
CO2	Analyze the various threats and Attack tools.
CO3	Describe the Data Security and Storage.
CO4	Analyze the Security Management in the Cloud

COURSE CONTENT		
MODULE – 1	**Over view of Cloud Computing**	**9H**
Overview of Cloud Computing: Introduction, Definitions and Characteristics, Cloud Service Models, Cloud Deployment Models, Cloud Service Platforms, Challenges Ahead. Introduction to Cloud Security: Introduction, Cloud Security Concepts, CSA Cloud Reference Model, NIST Cloud Reference Model, NIST Cloud Reference Model.		
MODULE – 2	**Cloud Security and Privacy Issues**	**9H**
Cloud Security and Privacy Issues: Introduction, Cloud Security Goals/Concepts, Cloud Security Issues, Security Requirements for Privacy, Privacy Issues in Cloud. Infrastructure Security: The Network Level, the Host Level, the Application Level, SaaS Application Security, PaaS Application Security, IaaS Application Security.		
MODULE – 3	**Threat Model and Cloud Attacks**	**9H**
Threat Model and Cloud Attacks: Introduction, Threat Model- Type of attack entities, Attack surfaces with attack scenarios, A Taxonomy of Attacks, Attack Tools- Network-level attack tools, VM-level attack tools, VMM attack tools, Security Tools, VMM security tools.		
MODULE – 4	**Data Security and Storage**	**9H**
Information Security Basic Concepts, an Example of a Security Attack, Cloud Software Security Requirements, Rising Security Threats. Data Security and Storage: Aspects of Data Security, Data Security Mitigation, Provider Data and Its Security.		
MODULE – 5	**Security Management in the Cloud**	**9H**
Evolution of Security Considerations, Security Concerns of Cloud Operating Models, Identity Authentication, Secure Transmissions, Secure Storage and Computation, Security Using Encryption Keys, Challenges of Using Standard Security Algorithms, Variations and Special Cases for Security Issues with Cloud Computing, Side Channel Security Attacks in the Cloud. Security Management in the Cloud- Security Management Standards, Availability Management, Access Control, Security Vulnerability, Patch, and Configuration Management.		
	Total hours:	**45 hours**

Text Books

1. Preeti Mishra, Emmanuel S Pilli, Jaipur R C Joshi Graphic Era., ―Cloud Security
2. Tim Mather, SubraKumaraswamy, and ShahedLati―Cloud Security and Privacy‖,1st Edition, 2019, O'Reilly Media, Inc.

References Books:

Naresh Kumar Sehgal Pramod Chandra, P. Bhatt John M. Acken., ―Cloud Computing with Security Concepts and Practices‖, 2nd Edition Springer nature Switzerland AG 2020.

Essentials of Cloud Computing by K. Chandrasekaran Special Indian Edition CRC press.

Raj kumar Buyya,―Cloud Computing Principles and Paradigms‖, John Wiley.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc19_cs64/preview
- https://archive.nptel.ac.in/courses/106/105/106105167/

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	No SQL Lab							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05H06	0	0	3	36	1.5	30	70	100

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

CO 1	Install, configure, and use MongoDB for database operations.
CO 2	Create and manipulate databases and collections using MongoDB.
CO 3	Perform CRUD (Create, Read, Update, Delete) operations with filtering, projection, and sorting.
CO 4	Implement indexing and performance optimization techniques in MongoDB.
CO 5	Integrate MongoDB with Java and PHP applications for data-driven development.

COURSE CONTENT	
List of Experiments	
TASK–1	
Mongo DB installation and configuration in windows.	
TASK–2	
Demon strate how to create and drop a database in Mongo DB.	
TASK–3	
Creating the Collection in Mongo DB on the fly	
TASK–4	
Creating collection with options before inserting the documents and drop the collection created.	
TASK–5	
Mongo DB insert document a. Insert single document b. Insert multiple documents in collection	
TASK–6	
Querying all the documents in json format and Querying based on the criteria.	
TASK–7	
Mongo DB update document a. Using update() method. b. Using save() method.	
TASK–8	
MongoDB delete document from a collection. a. Using remove() method. b. Remove only one document matching your criteria c. Remove all documents	
TASK–9	
Mongo DB Projection	
TASK–10	
limit() ,skip(), sort() methods in Mongo DB	
TASK–11	
Mongo DB indexing a. Create index in Mongo DB b. Finding the indexes in a collection c. Drop indexes in a collection d. Drop all the indexes	
TASK–12	
Mongo DB with java and PHP a. Create a simple application that uses Mongo DB with Java b. Create a simple application that uses Mongo DB with PHP	
Total hours:	**36 hours**

Text Books:

1. **"MongoDB: The Definitive Guide"** by Kristina Chodorow, O'Reilly Media.

Reference Books:

1. **"NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence"** by Pramod J. Sadalage and Martin Fowler, Addison-Wesley.
2. **"Mastering MongoDB 6.x"** by Alex Giamas, Packt Publishing.
3. **MongoDB Documentation** – https://www.mongodb.com/docs/

NARAYANA ENGINEERING COLLEGE :: GUDUR								
	Quantum & Cloud Computing Lab							R23
Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
23A05H07	0	0	3	36	1.5	30	70	100

Course Objectives (COs)

This course aims to:

1. Introduce fundamental quantum computing concepts such as qubits, superposition, and quantum gates using Qiskit.
2. Develop an understanding of quantum algorithms through practical implementation, including Deutsch's algorithm.
3. Provide hands-on experience in cloud computing by simulating cloud environments, VM allocation, and scheduling policies.
4. Analyze cloud resource management techniques such as load balancing and deployment models.
5. Explore cloud security challenges by simulating cyber threats like Denial of Service (DoS) attacks.

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

CO 1	Implement and compare classical and quantum bits using Qiskit.
CO 2	Design and analyze quantum circuits using logic gates and linear algebra principles.
CO 3	Simulate and evaluate cloud computing infrastructures including data centers, VM allocation, and scheduling policies.
CO 4	Apply resource provisioning techniques to optimize cloud performance and load balancing.
CO 5	Assess cloud security threats by implementing and analyzing DoS attack simulations.

COURSE CONTENT	
List of Experiments	
TASK–1	
Simulating Classical vs Quantum Bits a. Implement **classical bits and qubits** using Qiskit. b. Compare **bit flip** vs **quantum superposition** using Hadamard gates.	
TASK–2	
Quantum Logic Gates Implementation a. Implement and visualize basic **quantum gates** (X, Y, Z, H, S, T). b. Apply these gates to single and multiple qubits.	
TASK–3	
Linear Algebra in Quantum Computing a. Represent **quantum states** using matrices and vectors. b. Perform **matrix operations** (addition, multiplication, tensor product).	
TASK–4	
Deutsch's Algorithm Implementation a. Demonstrate quantum parallelism using **Deutsch's algorithm**. Compare results with classical computation.	
TASK–5	
S**imulation of a Simple Cloud Data Center**: Create a cloud environment with multiple **Hosts, Virtual Machines (VMs), and Cloudlets**.	
TASK–6	
VM Allocation and Scheduling Policies: Implement and compare **Time-Shared and Space-Shared** VM allocation policies.	
TASK–7	
Resource Provisioning and Load Balancing : Simulate dynamic **resource allocation** for better load balancing.	
TASK–8	
Cloudlet Scheduling Algorithms: Implement and compare FCFS (First-Come-First- Serve), Round Robin, and Priority-Based Scheduling.	
TASK–9	
Performance Analysis of Cloud Deployment Models : Simulate and compare **Public, Private, Hybrid, and Community Cloud** environments.	
TASK–10	
Simulating Denial of Service (DoS) Attacks: Implement a scenario where multiple requests overload a cloud server.	
Total hours:	**36 hours**

Text Books:

2. Shashank Tiwari, Professional No SQL, Wrox Press, Wiley, 2011, ISBN: 978-0-470-94224-6
3. Pramod Sadalage and Martin Fowler, No SQL Distilled, Addison-Wesley Professional, 2012.

2.

Reference Books:

4. Dan McCreary and Ann Kelly, Making Sense of No SQL, Manning Publications, 2013.
5. Gaurav Vaish, Getting Started with No SQL, Packt Publishing, 2013.

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