MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Information Technology

Scheme of Evaluation

B. Tech. in Internet of Things (IoT)

I Semester

For batch admitted in academic session 2021 – 22

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per Week			Total Credits	Mode of Teaching (Offline/ Online)	Mode of Exam.
				Theory Slot				Practical Slot									
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P			
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assign ment		Lab work & Sessional	Skill Based Mini Project							
1.	230101	DC	Introduction to Internet of Things (IoT)	50	10	20	20	-	-	-	100	4	-	-	4	Blended (3/1)	MCQ
2.	230102	DC	Introduction to Computer Programming	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	AO
3.	100022	ESC	Basic Electrical & Electronics Engineering	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	MCQ
4.	250100	BSC	Linear Algebra	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP
5.	100015	HSMC	Energy, Environment, Ecology & Society	50	10	20	20	-	-	-	100	3	-	-	3	Online	MCQ
Total				**250**	**50**	**100**	**100**	**120**	**40**	**40**	**700**	**14**	**03**	**04**	**19**	-	-

Induction program of first three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visit / Virtual Visit to local Areas, Familiarization to Dept./Branch & Innovations

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MCQ: Multiple Choice Question **AO:** Assignment + Oral **OB:** Open Book **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching					Mode of Examination				
Theory				Lab	Theory			Lab	Total Credits
Offline	Online	Blended		Offline	PP	A+O	MCQ	SO	
		Offline	Online						
04	03	07	03	02	04	03	10	02	19
21.05%	15.79%	36.84%	15.79%	10.53%	21.05%	15.79%	52.63%	10.53%	Credits %

DEAN (ACADEMICS)
M.I.T.S
GWALIOR

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Department of Information Technology

Scheme of Evaluation

B. Tech. in Internet of Things (IoT)

II Semester

For batch admitted in academic session 2021 –22

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per Week			Total Credits	Mode of Teaching (Offline/ Online)	Mode of Exam.
				Theory Slot				Practical Slot				L	T	P			
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation								
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project							
1.	230201	DC	Digital Logic Design	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
2.	220202	DC	Sensor Technology	50	10	20	20	60	20	20	200	3	-	2	4	Blended (2/1)	PP
3.	230202	DC	Data Structures	50	10	20	20	60	20	20	200	3	-	2	4	Blended (2/1)	PP
4.	230203	DC	Object Oriented Programming and Methodology	50	10	20	20	60	20	20	200	3	-	2	4	Blended (2/1)	AO
5.	100016	HSMC	Technical Language	50	10	20	20	-	-	-	100	3	-	-	3	Blended (2/1)	PP
6.	100017	HSMC	Language Lab	-	-	-	-	60	20	20	100	-	-	2	1	Offline	SO
Total				**250**	**50**	**100**	**100**	**240**	**80**	**80**	**900**	**14**	**01**	**08**	**19**	-	-
Summer Internship Project – I (Institute Level) (Qualifier): Minimum two-week duration: Evaluation in III Semester.																	

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MCQ: Multiple Choice Question **AO**: Assignment + Oral **OB**: Open Book **PP**: Pen Paper **SO**: Submission + Oral

Mode of Teaching					Mode of Examination				
Theory				Lab	Theory			Lab	
Offline	Online	Blended		Offline	PP	A+O	MCQ	SO	
		Offline	Online						
-	-	10	05	04	12	03	-	04	19
-	-	52.63%	26.32%	21.05%	63.16%	15.79%	-	21.05%	Credits %

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Department of Information Technology

Scheme of Evaluation

B. Tech. Internet of Things (IoT)

III Semester

(for batch admitted in academic session 2021-22)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching (Offline/ Online)	Mode of Exam.
				Theory Slot				Practical Slot				L	T	P			
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation								
				End Sem. Exam.	$ Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project							
1.	250106	BSC	Probability and Random Process	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP
2.	230301	DC	Design & Analysis of Algorithms	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
3.	230302	DC	Operating System	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
4.	230303	DC	Computer Networks and Protocols	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
5.	230304	DC	Database Management System	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
6.	230305	DLC	Design and Thinking Lab	-	-	-	-	60	20	20	100	-	-	2	1	Offline	SO
7.	230306	DLC	Self-learning/Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	40	-	40	-	-	2	1	Online and Mentoring	SO
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	230307	DLC	Summer Internship Project–I (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
Total				250	50	100	100	290	100	60	950	11	5	14	23	-	-
10.	1000005	MAC	Project Management & Financing	50	10	20	20	-	-	-	100	2	-	-	GRADE	Online	MCQ

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MCQ: Multiple Choice Question AO: Assignment + Oral PP: Pen Paper SO: Submission + Oral

Mode of Teaching						Mode of Examination					
Theory				Lab	NEC	Theory			Lab	NEC	Total Credits
Offline	Online	Blended		Offline	Interactive	PP	A+O	MCQ	SO	SO	
		Offline	Online								
04	-	08	04	06	01	16	-	-	06	01	23
17.39%	-	34.78%	17.39%	26.09%	4.35%	69.56%	-	-	26.09%	4.35%	Credits %

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Scheme of Evaluation

B. Tech. Internet of Things (IoT)

IV Semester

(for batch admitted in academic session 2021 – 22)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot				L	T	P			
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation								
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab Work & Sessional	Skill Based Mini Project							
1.	230401	DC	Computer Architecture and Microprocessor	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP
2.	230402	DC	Cloud Computing	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP
3.	230403	DC	Software Engineering	50	10	20	20	60	20	20	200	3	-	2	4	Blended	MCQ
4.	230404	DC	IoT Architecture and Protocols	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP
5.	230405	DC	Network & Web Security	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP
6.	230406	DLC	Python Programming Lab	-	-	-	-	60	20	20	100	-	1	2	2	Offline	SO
7.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
Total				250	50	100	100	230	60	60	850	14	02	08	20	-	-
8.	1000001	MAC	Indian Constitution and Traditional Knowledge	50	10	20	20	-	-	-	100	2	-	-	GRADE	Online	MCQ
Summer Internship Project-II (Soft skills Based) for two weeks duration: Evaluation in V Semester																	

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MCQ: Multiple Choice Question AO: Assignment + Oral OB: Open Book PP: Pen Paper SO: Submission + Oral

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	A+O	MCQ	SO	SO	
01	-	15	03	01	12	-	03	04	01	20
5%	-	75%	15%	5%	60%	-	15%	20%	5%	Credits

02.03.2023

DEAN (ACADEMICS)

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Department of Information Technology

Scheme of Evaluation

B. Tech. Internet of Things (IoT) V Semester

(for batch admitted in academic session 2021-22)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.
				Theory Slot				Practical Slot									
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation			L	T	P			
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project							
1.	230501	BSC	Discrete Structures	50	10	20	20	-	-	-	100	2	1	-	3	Offline	PP
2.	230502	DC	Data Sciences in IoT	50	10	20	20	60	20	20	200	3	-	2	4	Blended	MCQ
3.	230503	DC	Theory of Computation	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP
4.	230504	DC	Embedded System & IoT	50	10	20	20	60	20	20	200	3	-	2	4	Blended	PP
5.	230505	DC	Soft Computing Techniques	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP
6.	230506	DLC	Minor Project-I**	-	-	-	-	60	40	-	100	-	-	4	2	Offline	SO
7.	230507	Seminar/ Self-Study	Self-learning/Presentation (SWAYAM/NPTEL/ MOOC)#	-	-	-	-	-	40	-	40	-	-	2	1	Online and Mentoring	SO
8.	200XXX	**CLC**	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	230508	DLC	Summer Internship Project-II (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO
Total				**250**	**50**	**100**	**100**	**350**	**140**	**60**	**1050**	**13**	**02**	**18**	**24**	**-**	**-**
10.	1000006	**MAC**	Disaster Management	50	10	20	20	-	-	-	100	2	-	-	GRADE	Online	**MCQ**
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**													

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** **The minor project-I may be evaluated by an internal committee for awarding sessional marks.**

Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance, assignments and presentation

Mode of Teaching					Mode of Examination					Total Credits
Theory			Lab	NEC	Theory			Lab	NEC	
Offline	Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
03	-	12	08	01	12	-	03	08	01	24
12.50%	-	50.00%	33.33%	4.17%	50.00%	-	12.50%	33.33%	4.17%	Credits %

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List of courses to be opted for Minor specialization in V Semester

Minor specialization * *(to be opted by students of Other Department)*	
Course Code	**Course Name**
IO0522M1	Introduction to Internet of Things (12 Weeks)
IO0522M2	Introduction to Operating Systems (8 Weeks)
IO0523M1	Computer Graphics (8 Weeks)

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

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DEPARTMENT OF INFORMATION TECHNOLOGY

INTRODUCTION TO INTERNET OF THINGS (IoT)
230101 (DC)

L	T	P	Total Credits
4	-	-	4

COURSE OBJECTIVES

- To understand basic terminology of Internet of Things.
- To understand technology behind interaction between things.
- To understand basic terminology of Internet of Things.

Unit I

Internet of things (IoT) : Introduction, Evaluation of IoT concept, Definition, Key features and components, IoT Building block, IoT Characteristics, Advantages and Disadvantages.

Unit II

IoT Applications, IoT application structures and driver technologies : collection, transmission, processing, managing, utilization phase, Telematics and Telemetry, Telematics vs IoT, Machine-to-Machine communication, M2M vs IoT, IoE, IIoT, V2V, V2X.

Unit III

IoT hardware and software, Study of IoT Sensors, Actuators, Wearable electronics, Standard devices, Concept of Cloud, Edge, Fog and Roof computing in IoT, Introduction to communication, Components of communication system, Modes of communication, Types of data transmission, IoT communication models : Device-to-Device, Device-to Cloud, Device-to-Gateway, and Back-End Data-Sharing, IoT Connectivity and Management.

Unit IV

Introduction to Internet and Networking Protocol, IoT protocols, Types of IoT Networks, Introduction of WSN, RF wireless sensors, RFID, WiFi, Bluetooth, IP Based Cellular Networks & 3G, 4G.

Unit V

IoT Challenges: Interoperability, Precision, Data volume and scalability, Internet connectivity, **IoT Security**: Security vulnerabilities in overall IoT system, Security vulnerabilities at different layers of IoT architecture, IoT Privacy and Trust, Standardization gap.

RECOMMENDED BOOKS

- Internet of Things from Hype to Reality, The Road to Digitization, Ammar Rayes and Samer Salam, Second Edition, Springer
- Internet of Things (IoT) Technology, Economic View And Technical Standardization, Etienne Schneider, Version 1.0, ILNAS
- Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies, Dimitrios Serpanos and Marilyn Wolf, Springer
- Data Communications and Networking, Behrouz A Forouzan, Fourth Edition, McGraw Hill Education

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COURSE OUTCOMES

After completion of the course students would be able to:

CO1. explain basic terminology of Internet of Things.

CO2. illustrate the role of communication in IoT.

CO3. identify and use various protocols devices that are used in IoT.

CO4. classify networking, cloud and fog computing concept for data management.

CO5. investigate challenges, security and privacy.

CO6. discuss different IoT enabled techniques behind interaction between things.

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DEPARTMENT OF INFORMATION TECHNOLOGY

INTRODUCTION TO COMPUTER PROGRAMMING

160112 / 230102

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To familiar with program readability/understanding including program style/formatting and self-documenting code.
- To familiar with debugging process.
- To design and implement basic programming solutions including statements, control structures, and methods.

Unit I

Introduction to Programming, Machine Level Languages, Assembly Level Languages, High Level Languages, Program Execution and Translation Process, Problem solving using Algorithms and Flowcharts. Introduction to C Programming: Data Types, Constants, Keywords, Operators & Expressions, Precedence of operators and input/output functions.

Unit II

Control Statements and Decision Making: The goto statement, The if statement, The if-else statement, Nesting of if statements, The conditional expression, The switch statement, The while loop, The do…while loop, The for loop, The nesting of for loops, The break and continue statement.

Unit III

Arrays, Strings & Pointers: One dimensional Arrays, Passing Arrays to Functions, Multidimensional Arrays, Strings, Basics of Pointers & Addresses, Pointer to Pointer, Pointer to Array, Array of Pointers, Types of pointers, Pointer to Strings.

Unit IV

Functions & Structures: Function Basics, Function Prototypes, Passing Parameter by value and by reference, Passing string to function, Passing array to function, Function returning

address, Recursion, Structures & Union, Pointer to Structure, Self-Referential Structures, Dynamic memory allocation by malloc/calloc function, Storage Classes.

Unit V

File Handling: Defining and Opening a file, Closing Files, Input/output Operations on Files, Predefined Streams, Error Handling during I/O Operations, Command Line Arguments.

RECOMMENDED BOOKS

- Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
- Paul Deitel and Harvey M. Deitel, How to Program, Pearson Publication.
- Yashavant Kanetkar , Let Us C, BPB publication.
- E. Balagurusamy, Programming in ANSI C, Tata McGraw-Hill.
- Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. identify situations where computational methods and computers would be useful.

CO2. describe the basic principles of imperative and structural programming.

CO3. develop a pseudo-code and flowchart for a given problem.

CO4. analyze the problems and choose suitable programming techniques to develop solutions.

CO5. design, implement, debug and test programs.

CO6. design computer programs to solve real world problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

INTRODUCTION TO COMPUTER PROGRAMMING
(160112/230102)
LIST OF EXPERIMENTS

1. Write a C program to add two numbers and display its sum.
2. Write a C program to input two number from the user and display the multiplication of these numbers.
3. Write a Program to calculate and display the volume of a cylinder for height and radius parameters to be input from the user.
4. Write C program to realize the following expressions:
   a. $V = u + at$
   b. $S = ut+1/2a$
   c. $T=2*a+\sqrt{b}+9c$
5. Write a program to take input of name, rollno and marks obtained by a student in 5 subjects of 100 marks each and display the name, rollno with percentage score secured.
6. Write a program to swap values of two variables with and without using third variable.
7. Write a program to illustrate the use of unary prefix and postfix increment and decrement operators.
8. Write a program to find the largest of three numbers using ternary operators.
9. Write a program to find the roots of quadratic equation.
10. Write a Program to Check Whether a Number is Prime or not.
11. Write a program to compute grade of students using if else ladder as per MITS norms.
12. Write a program to check whether the entered year is leap year or not (a year is leap if it is divisible by 4 and divisible by 100 or 400.)
13. Write a program to print the sum of digits of a number using for loop.
14. Write a program to display the following pattern using for loops.

(i)
```
* * * * *
* * * *
* * *
* *
*
```

(ii)
```
1
2 2
3 3 3
4 4 4 4
5 5 5 5 5
```

(iii)
```
    1
   1 2
  1 2 3
 1 2 3 4
1 2 3 4 5
```

(iv)
```
A
A B
A B C
A B C D
A B C D E
```

(v)

```
    *
   ***
  *****
 *******
*********
```

(vi)

```
*********
 *******
  *****
   ***
    *
```

(vii)

```
    1
   121
  12321
 1234321
123454321
```

(viii)

```
ABCDEF
ABCDE
ABCD
ABC
AB
A
```

(ix)

```
1
123
12345
123
1
```

(x)

```
*******
***  ***
**    **
*      *
```

(xi)

```
******
     *
    *
   *
  *
******
```

(xii)

```
*****
*   *
*   *
*   *
*****
```

15. Write a program to insert 10 elements into an array and print the elements of the array.
16. Write a program to calculate factorial of a number using recursion.

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DEPARTMENT OF INFORMATION TECHNOLOGY

INTRODUCTION TO COMPUTER PROGRAMMING
(160112/230102)

LIST OF SKILL BASED MINI PROJECT

1. Write a program to obtain the sum of the first two even digit and last two add digits of integer number given by user .Number has at least 8 digit.
2. Write a program to obtain a number N and increment its value by 1 if the number is divisible by 4 otherwise decrement its value by 1 until we get a prime number.
3. Consider the following 4×4 pattern:

   1 2 4 7

   3 5 8 11

   6 9 12 14

   10 13 15 16

   You are given an integer N. Write a program to print the N×N pattern of the same kind (containing integers 1 through N^2).
4. Following conditions are given based on three subjects marks
   a. Physics marks must be greater than 50
   b. Chemistry marks must be greater than 80
   c. English marks must be greater than 70

   Students is awarded grade 10 if all three conditions are met. Grade 9 is given if conditions a and b are met. Grade 8 is given if conditions b and c are met. Grade 7 is given if a and c are met. Grade is 6 if only one condition is met . Grade is 5 if none of the three conditions are met. Write a program to display the grade of students , based on the values of physics , chemistry and English , given by user.

5. Ram and Shyam are playing a game. Ram initially has the number **A** and Shyam has the number **B**. There are a total of **N** turns in the game, and Ram and Shyam alternatively take turns. In each turn the player whose turn it is, multiplies his or her number by 2. Ram has the first turn. Suppose after all the **N** turns, Ram's number has become **C** and Shyam's number has become **D**. Write a program to calculate the integer division of the maximum number among **C** and **D** by the minimum number among **C** and **D**.

6. An array **A** of **N** positive numbers is given. Write a program to find the number of subarrays for which the sum and product of elements are unequal.
7. There's an array A consisting of N non-zero integers $A_{1..N}$. A subarray of A is called alternating if we take any two adjacent elements in it, then one of them should be even and the other should be odd. For each x from 1 to N, write a program to compute the length of the longest alternating subarray that starts at x - that is, a subarray $A_{x..y}$ for the maximum possible $y \geq x$. The length of such a subarray is y-x+1.
8. Given an array $A_1, A_2, \ldots, A_N$, count the number of subarrays of array A which are non-decreasing. A subarray A[i,j], where $1 \leq i \leq j \leq N$ is a sequence of integers $A_i, A_{i+1}, \ldots, A_j$. A subarray A[i,j] is non-decreasing if $A_i \leq A_{i+1} \leq A_{i+2} \leq \ldots \leq A_j$. Write a program to count the total number of such subarrays.
9. Two strings A and B are given, each consisting of lower case alphabets. Write a program to find whether it is possible to choose some non empty strings s1 and s2 where s1 is a substring of A, s2 is a substring of B such that s1 + s2 is a palindromic string. Here '+' denotes the concatenation between the strings. And if there are such strings S1 and S2 then print S1+S2.
10. There are N students standing in a row and numbered 1 through N from left to right. You are given a string S with length N, where for each valid i, the i-th character of S is 'x' if the i-th student is a girl or 'y' if this student is a boy. Students standing next to each other in the row are friends .The students are asked to form pairs for a project work. Each pair must consist of a boy and a girl. Two students can only form a pair if they are friends. Each student can only be part of at most one pair. Write a program to find the maximum number of pairs that can be formed.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA STRUCTURES

160211/230202

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To be familiar with the use of data structures as the foundational base for computer solutions to problems.
- To understand various techniques of searching and sorting.
- To understand basic concepts about stacks, queues, lists, trees and graphs.

Unit-I

Introduction to Data Structures: Algorithms & their characteristics, asymptotic notations. arrays and its representations, index to address translation. **Link list:** Introduction, implementation of linked list, operations, circular link list, doubly linked list, polynomial manipulation using linked list.

Unit-II

Stacks: Concepts and implementation of stacks, operations on stack, conversion of infix to postfix notation, evaluation of postfix expression, recursion.

Queues: Concepts and implementation, operations on queues, dequeue, priority queues, circular queues and application.

Unit-III

Trees: Types, terminology, binary tree -representations, traversal, conversion of general tree to binary tree, binary search tree, threaded binary tree and height balanced tree.

Unit-IV

Graphs: Background, graph theory terminologies, representation of graphs- sequential & linked representation, path matrix, graph traversals- BFS, DFS, spanning trees, applications of graph.

Unit-V

Searching & Sorting: Linear search, binary search, bubble sort, selection sort, insertion sort, quick sort, merge sort, radix sort and heap sort, comparison between sorting techniques, hashing and collision resolution techniques.

RECOMMENDED BOOKS

- Data Structures, Algorithms and Applications in C++, Sartaj Sahni, 2 nd Edition.
- An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Mcgraw hill.
- Data Structures & Algorithms, Aho, Hopcroft & Ullman, original edition, Pearson Publication.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. outline the basics of Algorithms and their performance criteria's.

CO2. explain the working of linear/Non Linear data structures.

CO3. identify the appropriate data structure to solve specific problems.

CO4. analyze the performance of various Data Structures & their applications.

CO5. evaluate the time/space complexities of various data structures & their applications.

CO6. design the optimal algorithmic solutions for various problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DIGITAL LOGIC DESIGN

230201

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To understand the fundamental operating components of Digital Computers
- To learn various number systems, boolean algebra employed in digital computers
- To understand the concept of counters, latches and flip-flops.

Unit-I

Introduction to Digital Electronics, Needs and Significance, Different Number System: Binary Numbers, Octal and Hexadecimal Numbers, Conversions, Complement's, Signed Binary Numbers, Binary Arithmetic's, Binary Codes: BCD, ASCII Codes.

Unit-II

Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Boolean Relations, Digital Logic Gates, De Morgan's Theorem, Karnaugh Maps and simplifications.

Unit-III

Combinational Circuits, Half Adder, Full Adder, Binary Adder-Subtractor, Binary Multiplier, Comparator, Decoders, Encoders, Multiplexers, Programmable Devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL).

Unit-IV

Sequential Circuits, Latches, Flip-Flops: RS Latches, Level Clocking, D Latches, Edge-triggered D Flip-flop, Edge-triggered JK Flip-flop, JK Master-slave Flip-flop; Registers, Shift Registers, Counters, Ripple Counters, Synchronous Counters.

Unit-V

Introduction to Memory, Memory Decoding, Error Detection and Correction, Programmable Logic Array, Programmable Array Logic, Sequential (or simple)

programmable logic device (SPLD), Complex programmable logic device (CPLD), Field-programmable gate array (FPGA), Digital Logic Design: Sequential Programmable Devices, RTL and DTL Circuits, TTL, ECL, MOS, CMOS, Application Specific Integrated Circuits.

RECOMMENDED BOOKS

- Digital Design, Morris Mano M. and Michael D. Ciletti, IV Edition, Pearson Education.
- Digital Electronics: Principles, Devices and Applications, Anil K. Maini, Wiley.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. explain the basic components and functional units to define computer architecture
CO2. explain different number systems and basic operations employed at machine level.
CO3. develop the understanding of combinational circuits.
CO4. analyse the basic concept of sequential circuits.
CO5. compare and differentiate various memories used in Computers.
CO6. reduce the Boolean functions to mitigate hardware complexity issues.

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DEPARTMENT OF INFORMATION TECHNOLOGY

OBJECT ORIENTED PROGRAMMING AND METHODOLOGY

160212 /230203

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To study about the concept of object oriented programming.
- To create C++ programs that leverage the object oriented features of the C++ Language.
- To apply object oriented or non-object oriented techniques to solve bigger computing problems.

Unit-I

Introduction to C++ and Object Oriented Concepts: Basics of C++, Tokens, I/O Statements, Structure of Program, Operators and Expressions, Flow of Control, Arrays, Structures, Functions and its type, Function Prototyping, Pointers, Pointer Variables, Pointers and Arrays, Array of Pointers, Pointers and Structures, Dynamic Memory Allocation.

Programming Techniques: Unstructured & Structured Programming, Object Oriented Paradigm, Features of Oops, Comparison with Procedural Oriented Programming & Object Oriented Programming, Abstract Data Types, Reference Variable, Scope Resolution Operator.

Unit-II

Classes & Objects: Specification of Class, Visibility Modes: Private, Public, Protected, Defining Member Functions, Creating of Objects, Characteristics of Object, Static Data Member, Static Member Function, Array of Objects, Object as Arguments, Inline Function, Default Arguments, Friend Function, Recursion.

Constructors and Destructors: Introduction, Types of Constructors- Default Constructor, User Defined Constructor, Parameterized Constructor, Copy Constructor, Constructor with Default Arguments, Rules of Constructor Definition and Usage, Destructors.

Unit-III

Polymorphism: Introduction, Type of Polymorphism: Compile Time Polymorphism & Run Time Polymorphism, Function Overloading, Operator Overloading: Binary

Operators, Arithmetic Assignment Operators, Unary Operators, Rules for Operator Overloading, Pitfalls of Operator Overloading, Data Conversion, Type Casting.

Unit-IV

Inheritance: Introduction to Code Reuse, Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Multipath. Virtual Base Classes, Abstract Classes, Constructors in Derived Classes, Nesting of Classes, Overriding Member Function. Containership: Classes with in Classes, Function Overriding.

Unit-V

Pointer & File Concept: Pointers Overview, Pointers to Objects, This Pointer, Pointers to Derived Classes, Virtual Functions & Pure Virtual Function, Association, Type of Association, Aggregation, File Concepts, Study of Various Files and Streams, Opening and Closing of Files- Functions Get(), Getline(), Put(), Opening The Files Using Function Open(), File Manipulator Function.

RECOMMENDED BOOKS

- C++ How to Program, H M Deitel and P J Deitel, Prentice Hall.
- Programming with C++, D Ravichandran, T.M.H.
- Computing Concepts with C++ Essentials, Horstmann, John Wiley.
- The Complete Reference in C++, Herbert Schildt, TMH.
- Object-Oriented Programming in C++, E Balagurusam.
- Fundamentals of Programming C++, Richard L. Halterman.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. tell the concepts of classes & objects and their significance in real world.

CO2. explain the benefits of object oriented design.

CO3. build C++ classes using appropriate encapsulation and design principles.

CO4. analyze the utilization of inheritance and polymorphism in the solution of problems.

CO5. choose appropriate object orient programming concepts for solving real world problems.

CO6. develop solutions to problems demonstrating usage of control structures, modularity, I/O and other standard language constructs.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA STRUCTURES
(160211/230202)
LIST OF EXPERIMENTS

1. Write a program for implementing the following sorting methods to arrange a list of integers in ascending order:
   a. Selection sort
   b. Quick sort
   c. Merge sort
2. Write a program to implement Stack using array.
3. Write a program to count the number of nodes in the binary search tree.
4. Write a program to implement stack using linked list.
5. Write a program to implement AVL Tree.
6. Write a program to implement Breadth First Search and Depth First Search.
7. Write a program to implement graph using array.
8. Write a program to implement Spanning Tree.
9. Write a program to implement Heap Sort.
10. Write a program to implement binary search algorithm.

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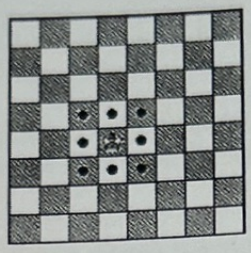
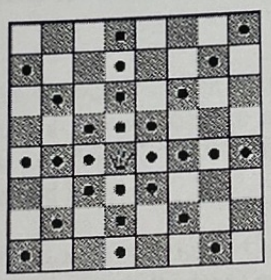
DEPARTMENT OF INFORMATION TECHNOLOGY

DATA STRUCTURES
(160211/230202)
LIST OF SKILL BASED MINI PROJECT

1. Write a program to implement King Travails on the standard 8x8 chess board. (The king moves one square in any direction, horizontally, vertically, or diagonally.)



2. Write a program to implement Queen Travails on the standard 8x8 chess board. (The queen may move in any straight line, horizontal, vertical, or diagonal.)



3. Implement the Phone directory application using doubly-linked lists.
4. Design and solve any puzzles with only one solution, such as mazes. (DFS can be adapted to find all solutions to a maze by only including nodes on the current path in the visited set.)
5. Write a program to evaluate any arithmetic expressions using STACK.
6. Write a program to implement priority queue for airport check in process.

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DEPARTMENT OF INFORMATION TECHNOLOGY

OBJECT ORIENTED PROGRAMMING AND METHODOLOGY
(160212/230203)
LIST OF PROGRAMS

1. WAP to swap two integers without using a third variable. The swapping must be done in a different method in a different class.
2. WAP that uses a class where the member functions are defined outside a class.
3. WAP to find the greater of two given numbers in two different classes using friend function.
4. Create an abstract class Shape which has a field PI=3.14 as final and it has an abstract method Volume. Make two subclasses Cone and Sphere from this class and they print their volume.
5. Create a class called LIST with two pure virtual function store() and retrieve().To store a value call store and to retrieve call retrieve function. Derive two classes stack and queue from it and override store and retrieve.
6. WAP to define the function template for calculating the square of given numbers with different data types.
7. Design a class to represent a bank account. Which include contains account number, name of the depositor, type of the account, balance amount in the account. Define Methods, to assign initial values, to Deposit an amount, to Withdraw amount after checking balance, to display name and balance.
8. Create an inheritance hierarchy of Rodent, Mouse, Gerbil, Hamster etc. In the base class provide methods that are common to all Rodents and override these in the derived classes to perform different behaviors, depending on the specific type of Rodent. Create an array of Rodent, fill it with different specific types of Rodents and call your base class methods.
9. WAP Containing a Possible Exception. Use a Try Block to Throw it and a Catch Block to Handle it Properly.
10. WAP to raise an exception if any attempt is made to refer to an element whose index is beyond the array size.

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DEPARTMENT OF INFORMATION TECHNOLOGY

OBJECT ORIENTED PROGRAMMING AND METHODOLOGY
(160212/230203)
LIST OF SKILL BASED MINI PROJECTS

1. Using C++ OOP Program, create a billing system for the book inventory system.
2. Implement a shopping cart for any shop using C++ OOP Program
3. Using C++ OOP Program, develop an authentication system for login and registration of system.
4. Using C++ OOP Program, design a pattern matching mechanism for credit fraud detection system.
5. Implement the leave management for payroll management Using C++ OOP Program.
6. Demonstrate the overall mechanism for managing contact in any directory Using C++ OOP Program
7. Implement the analog and digital clock using C++ OOP Program.
8. Design a diary for maintaining personal & appointment details using C++ OOP Program.
9. Develop a module for designing a student report card using C++ OOP Program.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DESIGN & ANALYSIS OF ALGORITHMS
230301/240301

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To introduce the topic of algorithms as a precise mathematical concept.
- To study the techniques like recursion, divide and conquer, dynamic programming, greedy approach, backtracking and branch and bound.
- To practice their skills on many well-known algorithms and data structures designed to solve real-life problems.

Unit-I

Introduction to Computational Model: Algorithms and its Importance, Recurrences and Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithm, Review of Sorting & Searching Algorithms, **Basic Tree and Graph Concepts:** B-Trees and Traversal Techniques, Topological sort.

Unit-II

Divide and Conquer Method: Introduction and its Examples such as Finding the Maximum and Minimum, Binary Search, Merge Sort, Quick Sort and Strassen's Matrix Multiplication and Additional Real World Problems on Divide and Conquer.

Unit-III

Greedy Method: Introduction, Characteristics, Examples of Greedy Methods such as Single-Source Shortest Paths, **Minimum Cost Spanning Trees :** Prims's and Kruskal's Algorithm, Knapsack Problem, Dijkstra's Single Source Shortest Path Algorithm, Optimal Storage on Tapes.

Unit-IV

Dynamic Programming: Introduction, The Principle of Optimality, Examples of Dynamic Programming Methods such as – 0/1 Knapsack, Traveling salesman problem, Floyd's All Pairs Shortest Path, Longest Common Subsequence and Reliability Design, Matrix Chain Multiplication

Unit-V

Backtracking: Concept and its Examples like 4-Queen's Problem, Knapsack problem Hamiltonian Circuit Problem, Graph Coloring Problem etc. **Branch & Bound:** Introduction and its Examples like - Traveling Salesperson Problem etc. **NP-Completeness:** Introduction, Class P and NP, Polynomial Reduction, NP-Hard and NP-Complete Problems.

RECOMMENDED BOOKS

- Fundamentals of Computer Algorithms, Horowitz & Sahani, Universities press.
- Introduction to Algorithms, Coremen Thomas, Leiserson CE, Rivest RL, PHI.
- Design & Analysis of Computer Algorithms, Ullmann, Pearson.
- Algorithm Design, Michael T Goodrich, Robarto Tamassia, Wiley India.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. demonstrate a familiarity with major algorithms and data structures.

CO2. idenify important algorithmic design paradigms and methods of analysis.

CO3. analyze the performance of algorithms.

CO4. compare various algorithm design techniques.

CO5. select the design technique to solve any real world problem.

CO6. design efficient algorithm using various design techniques.

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DEPARTMENT OF INFORMATION TECHNOLOGY

OPERATING SYSTEM
230302/240302

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To provide basic knowledge of computer operating system structures and functioning.
- To compare several different approaches to memory management, file management and process management.
- To understand various problems related to concurrent operations and their solutions.

Unit I

Basics of Operating System: Generations, Types, Structure, Services, System Calls, System Boot, System Programs, Protection and Security.

Unit II

Process Management: Process Concepts, Process States, Process Control Block, Scheduling-Criteria, Scheduling Algorithms and their Evaluation, Threads, Threading Issues.

Unit III

Process Synchronization: Background, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Unit IV

Memory Management: Main Memory, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

Unit V

Storage Management: Mass-Storage Structure, Overview, Disk Structure, Disk Attachment, Disk Scheduling.

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free-Space Management.

RECOMMENDED BOOKS

- Operating System Concepts, Silberschatz, Ninth Edition, Willey Publication.
- Operating Systems, internals and Design Principles, Stallings, Seventh Edition, Pearson Publication.
- Modern Operating Systems, Tanenbaum, Fourth Edition. Pearson Publication.

COURSE OUTCOMES

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

CO1. tell the basic concept of operating systems.

CO2. explain the working procedure of the operating system.

CO3. analyze the various operating system problems and issues.

CO4. develop the solutions for various operating system problems and issues.

CO5. measure the performance of various scheduling and allocation techniques.

CO6. test the working of various scheduling and allocation techniques.

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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER NETWORKS AND PROTOCOLS

230303/240303

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- Familiarize the student with the basic taxonomy and terminology of the computer networking & Protocols.
- Provide detail knowledge about various layers, protocols and devices that facilitate networking.
- Enable students to deal with various networking problems such as flow control, error control and congestion control.

Unit-I

Introduction: Computer Network Types, OSI Reference Model & TCP/IP Reference Mode, Circuit Switching, Message Switching & Packet Switching, Frequency Division Multiplexing, Wavelength Division Multiplexing & Time Division Multiplexing, ISDN, SONET.

Physical Layer : Data Transmission Modes, Network topologies, Line Coding, Synchronous & Asynchronous Transmission, Transmission Medium- Guided & Unguided, Networking Devices, Performance Criteria.

Unit-II

Data Link Layer: Introduction, Design Issues, Services, Framing, Error Control, Flow Control, ARQ Strategies, Error Detection and Correction, Parity Bits, Cyclic Redundant Code (CRC), Hamming Codes, MAC Sub Layer- Channel Allocation Problem, Pure ALOHA ,Slotted ALOHA, CSMA ,CSMA/CD, IEEE 802.3, IEEE 802.4 and IEEE 802.5, HDLC.

Unit-III

Network Layer Protocols: Introduction, Design Issues, Services, Routing- Distance Vector Routing, Hierarchical Routing & Link State Routing, Shortest Path Algorithm- Dijkstra's Algorithm & Floyd–Warshall's Algorithm, Routing Protocols, Flooding, Connection Oriented & Connectionless Service, IP Addressing, IPV4, IPV6, Internet Protocol Datagram, Fragmentation, ICMP, IGMP.

Unit-IV

Transport Layer Protocols: Datagram Protocol (UDP) - Process To Process Communication, Port Number, Socket Address, User Datagram, UDP Operation. TCP Services, Process To Process Communication, Stream Delivery Service, Full Duplex Communication, Connection Oriented Service, Reliable Service, TCP Features- Numbering System, Flow Control, Error Control, Congestion Control , TCP Segment, Flow Control-Sliding Window Protocol, Silly Window Syndrome Error Control- Checksum, Acknowledgement, Retransmission, Congestion Control.

Unit-V

Application Layer Protocols: Introduction, Design Issues, Presentation Layer- Translation, Encryption- Substitutions and Transposition Ciphers, Compression- Lossy and Lossless. Session Layer – Dialog Control, Synchronization. Application Layer- Remote Login, File Transfer & Electronic Mail. Domain Name System (DNS), Telnet, FTP, TFTP, Email Protocol: SMTP, POP, IMAP.

RECOMMENDED BOOKS

- Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill.
- Computer Networks, Andrew S. Tanenbaum, Pearson Education India.
- Computer Networks and Internets, Douglas E. Comer, Pearson India.
- TCP/IP Protocol Suite, B. A. Fourozan, Tata McGraw Hill
- Internetworking with TCP/IP, Douglas E. Comer, Publisher- PHI, New Delhi
- TCP/IP Illustrated by Richard Stevens, Publisher- Addison – Wesley.

COURSE OUTCOMES

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

CO1. explain the fundamental concepts of computer network.

CO2. illustrate the basic taxonomy & terminologies of computer network protocols.

CO3. develop a concept for understanding advance computer network.

CO4. build the skill of IP addressing and routing mechanism.

CO5. predict the performance of computer network in congestion and internet.

CO6. construct the network environment for implementation of computer networking concept.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATABASE MANAGEMENT SYSTEM

230304/240304

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVES

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modelling, relational, hierarchical and network models.
- To understand and use data manipulation language to query, update and manage a database.

Unit-I

DBMS: Database Approach v/s Traditional File Approach, Advantages of Database System, Database Users and Administrator, Database System Environment, Application Architectures, Schemas, Instances, Data Independence, Data Models: Hierarchical Data Model, Network Data Model & Relational Data Model, Comparison between Models.

Entities and Relationship Model: Entity types, Entity sets, Attributes and Keys, Relationship Types and Sets, Constraints, Design issue, E-R Diagram, Weak Entity Sets.

Unit-II

Relational Model: Structure of Relational Databases: Relation, Attribute, Domain, Tuples, Degree, Cardinality, Views, Database Relations, Properties of Relations, Attributes, Keys, Attributes of Relation, Domain Constraints, Integrity Constraints.

Relational Algebra: Concepts and Operations: Select, Project, Division, Intersection, Union, Division, Rename, Join etc.

Relational Calculus: Tuple Relational Calculus, Domain Relational Calculus.

Unit-III

SQL: Purpose of SQL, Data Definition Language (DDL) Statements, Data Manipulation Language (DML) Statements Update Statements & Views in SQL, Data Control Language (DCL), Triggers.

Unit-IV

Relational Database Design: Purpose of Normalization, Data Redundancy and Update Anomalies, Functional Dependency, The Process of Normalization, Various Normal Forms: 1NF, 2NF, 3NF, BCNF, Decomposition, Desirable Properties of Decomposition: Dependency Preservation, Lossless Join, Problems with Null Valued & Dangling Tuple, Multivalued Dependencies.

Unit-V

Transaction Management: Transaction Concept, Transaction State, Concurrent Executions, Serializability: Conflict and View Serializability, Concurrency Control: Lock-Based Protocol, Recovery: Log-Based Recovery.

RECOMMENDED BOOKS

- Database System Concepts, Abraham Silberschatz Henry F. Korth S. Sudarshan, McGraw-Hill 6th Edition.
- Database Management System, Raghu Ramakrishnan Johannes Gehrke, McGraw Hill 3rd Edition.
- Fundamentals of Database System, Elmasri & Navathe, Addison-Wesley Publishing, 5th Edition.
- An Introduction to Database Systems, Date C. J, Addison-Wesley Publishing, 8th Edition.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. demonstrate the concepts of different types of database system.

CO2. apply relational algebra concepts to design database system.

CO3. make use of queries to design and access database system.

CO4. analyze the evaluation of transaction processing and concurrency control.

CO5. determine the normal form of the relation.

CO6. design a ER diagram/database system for a real world application.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DESIGN & ANALYSIS OF ALGORITHMS
160312/230301/240301

LIST OF PROGRAMS

1. WAP to implement the following using array as data structure and analyze its time complexity.
   a. Insertion sort b. Selection sort c. Bubble sort d. Quick sort e. Merge sort
   f. Bucket sort g. Heap sort
2. WAP to implement Linear and Binary Search and analyze its time complexity.
3. WAP to implement Strassen's Matrix Multiplication.
4. WAP to implement Matrix Chain Multiplication and analyze its time complexity.
5. WAP to implement Longest Common Subsequence Problem and analyze its time complexity.
6. WAP to implement Optimal Binary Search Tree Problem and analyze its time complexity.
7. WAP to implement 0/1 knapsack using dynamic programming.
8. WAP to implement Dijkstra's Algorithm and analyze its time complexity.
9. WAP to implement Bellman Ford Algorithm and analyze its time complexity.
10. WAP to implement DFS and BFS and analyze their time complexities.
11. WAP to implement Travelling Salesman Problem using backtracking.
12. WAP to implement Topological sort algorithm and analyze their time complexities.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. relate the principles of algorithm design in solving problems.

CO2. demonstrate basic algorithms and different problem solving strategies.

CO3. build creativeness and confidence to solve non-conventional problems.

CO4. analyze running times of algorithms using asymptotic analysis.

CO5. compare various algorithm design approaches for solving real world problems.

CO6. design and implement optimization algorithms in specific applications.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DESIGN & ANALYSIS OF ALGORITHMS
160312/230301/240301

LIST OF SKILL BASED MINI PROJECT

1. Implement tree traversal techniques like pre-order, post-order and in-order.
2. Implementation of divide and conquer based merge sort algorithm, quick sort algorithm.
3. Implementation of divide and conquer based matrix multiplication algorithm.
4. Implement the greedy approach for single source shortest path.
5. Design a program for finding minimum cost tree for traversing all nodes of a graph.
6. Implement the Knapsack problem and 0/1 Knapsack problem.
7. Implement the travelling salesman problem using dynamic programming.
8. Implement matrix chain multiplication using dynamic programming.
9. Design a program for 4 and 8 queen problem.
10. Implement a program for polynomial reduction.
11. Implement a phone directory application using doubly-linked lists.
12. Implement the movement of knight in chess game.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATABASE MANAGEMENT SYSTEM
160313/ 230304/240304

LIST OF PROGRAMS

While creating tables, databases the name should have a prefix of your roll number.

Ex. If your roll number is 55 then every table name must start with 55 TABLE_NAME. 1. Write program name 2. Write description of command used for executing the query. 3. Write commands in bold letters. 4. Take the screenshot of the output.

1. Implementation of DDL commands of SQL with suitable examples.
   a. Create table
   b. Alter table
   c. Drop Table
2. Implementation of DML commands of SQL with examples.
   a. Insert
   b. Update
   c. Delete
3. Implementation of different type of function with suitable example
   a. Number function
   b. Aggregate function
   c. Character function
   d. Conversion function
   e. Data function
4. Implementation of different type of operators in SQL.
   a. Arithmetic operators
   b. Logical operators
   c. Set operator
   f. Comparison Operator
   g. Special operator
5. Implementation of type of joins.
   a. Inner Join
   b. Outer Join
   c. Natural Join etc.
6. Study and implementation of
   a. Group by & having clause
   b. order By clause
   c. Indexing
7. Study of Implementation of
   a. Sub queries
   b. Views
8. Study & implementation of different type of constraints.
9. Study & implementation of database backup & recovery command.
10. Study & implementation of Rollback, commit, savepoint.

11. Creating Database /Table Space
    a. Managing Users: Create User, Delete User
    b. Managing roles: Grant, Revoke.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. construct database schema for a given problem domain.

CO2. apply integrity constraints on a database schema using a state-of-the-art RDBMS.

CO3. apply SQL queries using DDL and DML to design and access database systems.

CO4. make use of operators and functions used in query.

CO5. distinguish Tables and Views for database systems.

CO6. develop a small project for a real world scenario.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATABASE MANAGEMENT SYSTEM
160313/ 230304/240304
LIST OF SKILL BASED MINI PROJECT

- Design, develop, and implement the specified queries for the following problems using Oracle, MySQL, MS SQL Server, or any other DBMS under LINUX/Windows environment.
- Design ER-Diagram, Create Schema and insert at least 5 records for each table. Add appropriate database constraints

Mini Skill Project 1

Consider the following schema for a Library Database:
BOOK (Book_id, Title, Publisher_Name, Pub_Year)
BOOK_AUTHORS (Book_id, Author_Name)
PUBLISHER (Name, Address, Phone)
BOOK_COPIES (Book_id, Programme_id, No-of_Copies)
BOOK_LENDING (Book_id, Programme_id, Card_No, Date_Out, Due_Date)
LIBRARY_PROGRAMME (Programme_id, Programme_Name, Address)

Write SQL queries to

1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each Programme, etc.
2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.
3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.
4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.
5. Create a view of all books and its number of copies that are currently available in the Library.

Mini Skill Project 2

Consider the following schema for Order Database:
SALESMAN (Salesman_id, Name, City, Commission)
CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id)
ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)
Write SQL queries to

1. Count the customers with grades above Bangalore's average.
2. Find the name and numbers of all salesman who had more than one customer.
3. List all the salesman and indicate those who have and do not have customers in their cities (Use UNION operation.)
4. Create a view that finds the salesman who has the customer with the highest order of a day.
5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Mini Skill Project 3

Consider the schema for Movie Database:
ACTOR (Act_id, Act_Name, Act_Gender)
DIRECTOR (Dir_id, Dir_Name, Dir_Phone)
MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)
MOVIE_CAST (Act_id, Mov_id, Role)
RATING (Mov_id, Rev_Stars)

Write SQL queries to

1. List the titles of all movies directed by 'Hitchcock'.
2. Find the movie names where one or more actors acted in two or more movies.
3. List all actors who acted in a movie before 2000 and in a movie after 2015 (use JOIN operation).
4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
5. Update rating of all movies directed by 'Steven Spielberg' to 5.

Mini Skill Project 4

Consider the schema for College Database:
STUDENT (USN, SName, Address, Phone, Gender)
SEMSEC (SSID, Sem, Sec)
CLASS (USN, SSID)
COURSE (Subcode, Title, Sem, Credits)
IAMARKS (USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

Write SQL queries to

1. List all the student details studying in fourth semester 'C' section.
2. Compute the total number of male and female students in each semester and in each section.
3. Create a view of Test1 marks of student USN '1BI15CS101' in all Courses.
4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.
5. Categorize students based on the following criterion:
If FinalIA = 17 to 20 then CAT = 'Outstanding'
If FinalIA = 12 to 16 then CAT = 'Average'
If FinalIA< 12 then CAT = 'Weak'
Give these details only for 8th semester A, B, and C section students.

Mini Skill Project 5

Consider the schema for Company Database:
EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo)
DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate)
DLOCATION (DNo,DLoc)
PROJECT (PNo, PName, PLocation, DNo)
WORKS_ON (SSN, PNo, Hours)

Write SQL queries to

1. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project.
2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise.
3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department.
4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator).
5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.

Mini Skill Project 6

A university registrar's office maintains data about the following entities:
(a)courses, including number, title, credits, syllabus, and prerequisites;
(b) course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom;
(c) students, including student-id, name, and program; and
(d) instructors, including identification number, name, department, and title. Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled.
Construct an E-R diagram forthe registrar's office. Document all assumptions that you make about the mapping constraints.

Mini Skill Project 7

Construct an E-R diagram for a car-insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents.

Mini Skill Project 8

Construct an E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted.

Mini Skill Project 9

Design an E-R diagram for keeping track of the exploits of your favourite sports team. You should store the matches played, the scores in each match, the players in each match and individual player statistics for each match. Summary statistics should be modeled as derived attributes.

Mini Skill Project 10

Consider a database used to record the marks that students get in different exams of different course offerings.
a. Construct an E-R diagram that models exams as entities, and uses a ternary relationship, for the above database.
b. Construct an alternative E-R diagram that uses only a binary relationship between students and course-offerings. Make sure that only one relationship exists between a particular student and course-offering pair, yet you can represent the marks that a student gets in different exams of a course offering.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DESIGN AND THINKING LAB
230305

LIST OF PROGRAMS

1. Introduction to Arduino Board and Arduino IDE (Installation and Setup)
2. Write a Program to Blink LED (Turn an LED on and off).
3. Write a Program to demonstrate the use of analog output to fade an LED.
4. Write a Program to read an analog input and prints the voltage to the serial monitor.
5. Write a Program to count the number of button pushes.
6. Write a Program to Control an LED using Button.
7. Write a program to detect object using IR Obstacle Sensor.
8. Write a program to detect presence of Gas using GAS Sensor.
9. Write a Program to Control Electronic Appliances using RELAY SHIELD Sensor.
10. Write a Program to measure Temperature and Humidity using DHT11 Sensor.
11. Write a program to detect motion using Motion Sensor (PIR sensor).
12. Write a Program to detect presence of smoke using Smoke Sensor.
13. Write a Program to play melody with a Piezo speaker.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define the basic concept of Embedded System.

CO2. describe the basic principles of Arduino programming and IDE.

CO3. familiarize with different types of sensors and related systems.

CO4. design, implement, debug and test programs/ system.

CO5. design and develop Smart systems applications.

CO6. build Arduino board using different sensors.

LIST OF SKILL BASED MINI PROJECT

1. Intelligent home locking system.
2. Intelligent water level management system.
3. Home automation using RFID.
4. Real time clock-based home automation.
5. Intelligent Automatic Irrigation System

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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER ARCHITECTURE AND MICROPROCESSOR
230401/240401/270401/280401

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVE

- To provide the fundamental knowledge of a computer system and its processing units.
- To provide the details of input & output operations, memory management and performance measurement of the computer system.
- To understand how computer represents and manipulate data.
- To understand different processors and basic architecture of 8/16 bit microprocessors.

Unit -I

Introduction: CPU structure and functions, processor organization, ALU, data paths, internal registers, status flags; System bus structure: Data, address and control buses. Processor control, micro-operations, instruction fetch, hardwired control, micro programmed control, microinstruction sequencing and execution.

Unit- II

Instruction set principles, machine instructions, types of operations and operands, encoding an instruction set, assembly language programming, addressing modes and formats.

Unit –III

Input-Output Organization: I/O organization; I/O techniques: interrupts, polling, DMA; Synchronous vs. asynchronous I/O.

Memory Organization: Memory system, internal and external memory, memory hierarchy, cache memory and its working, virtual memory concept.

Unit –IV

Microprocessors: 8085 microprocessor architecture; Instruction set, instruction types and formats; Instruction execution, instruction cycles, different types of machine cycles and timing diagram.

16-bit microprocessors, 8086 architecture, registers, memory segmentation and addressing.

Unit-V

Basic peripherals and interfacing: 8255, interfacing with LED's, ADC, DAC, stepper motors and I/O & Memory Interfacing, 8254, 8259, 8251.

RECOMMENDED BOOKS

- Computer System Architecture, Morris Mano, PHI.
- Microprocessor Architecture, Programming and Applications with the 8085, Gaonkar, Penram International Publishing (India) Pvt.Ltd.
- Computer Organization, Carl Hamacher, THM.
- Computer Architecture and Organization, J P Hayes, Mc-Graw Hills, New Delhi.
- The Intel. Microprocessors, Architecture, Programming and Interfacing, B.B. Brey (PHI)
- Microprocessor 8086: Architecture, Programming, and Interfacing, Sunil Mathur(PHI)
- Advanced Microprocessor and Interfacing, D.V. Hall (Mc-Graw Hill)
- Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing, A.K. Ray & K.M. Bhurchandi, Tata McGraw Hill.
- Interfacing techniques in Digital Design with emphasis on Microprocessors, R.L. Krutz (John Wiley)

COURSE OUTCOMES

After completion of the course, students would be able to:

CO1. demonstrate the computer architecture and microprocessor for defining basic component and functional unit.

CO2. develop the fundamental concept to understand the working of computer architecture and microprocessor.

CO3. explain the basic concept of input output and memory organization.

CO4. develop the skill of writing assembly language programming.

CO5. build a system using peripheral devices and controllers for 8086 microprocessors.

CO6. apply the concept computer architecture and microprocessor in solving real world problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

CLOUD COMPUTING
230402/240402/270402/280402

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To understand Cloud Computing concepts, technologies, architecture and applications.
- To understand the underlying principle of cloud virtualization, cloud storage, data management and data visualization.
- To understand different cloud programming platforms and tools to develop and deploy applications on cloud.

Unit- I

Cloud Architecture and Model: Technologies for Network-Based System, System Models for Distributed and Cloud Computing, NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics, Cloud Services, Cloud models (IaaS, PaaS, SaaS), Public vs Private Cloud, Cloud Solutions Cloud ecosystem, Service management, Computing on demand.

Unit- II

Virtualization: Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices. Virtual Clusters and Resource management, Virtualization for Data-center Automation.

Unit- III

Cloud Infrastructure: Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources.

Unit -IV

Programming Model: Parallel and Distributed Programming Paradigms- MapReduce, Twister and Iterative MapReduce, Hadoop Library from Apache, Google App Engine (GAE), Amazon Web Service (AWS), Smart Cloud, Public Clouds and Service Offerings. Microsoft Windows Azure.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Unit -V

Security in the Cloud: Security Overview, Cloud Security Challenges and Risks, Software-as-a-Service Security, Security Governance, Risk Management, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control.

RECOMMENDED BOOKS

- Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
- John W. Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
- Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
- Kumar Saurabh, " Cloud Computing — insights into New-Era Infrastructure", Wiley India,2011
- George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly
- James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define various basic concepts related to cloud computing.

CO2. identify the architecture, infrastructure and delivery models of cloud computing.

CO3. apply suitable virtualization concepts.

CO4. choose the appropriate programming models and public cloud platforms.

CO5. analyse various security issues in cloud computing.

CO6. compose virtualization, security and programming modules in cloud computing solutions.

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DEPARTMENT OF INFORMATION TECHNOLOGY

SOFTWARE ENGINEERING
160412/230403/240403/270403/280403

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To understand project management and risk management associated with various types of projects.
- To know basics of testing and understanding concept of software quality assurance and software configuration management process.

Unit - I

Introduction to Software Engineering: Definition, Software Engineering-Layered Technology, Software Characteristics and Components, **Software Model:** Software Development of Life Cycle Model (SDLC), The Waterfall Model, Iterative Waterfall Model, Prototyping Model, Spiral Model, RAD Model. **Selection Criteria of Model**: Characteristics of Requirements, Status of Development Team, Users Participation, Type of Project and Associated Risk.

Unit - II

Requirement Engineering: Definition, Requirement Engineering Activity , **Types of Requirement-** Functional and Non-functional Requirements, User and System Requirements, Requirement Elicitation Methods, Requirement Analysis Methods, Requirement Documentation (SRS), Requirement Validation, Requirement Management.

Unit - III

Design Concept, Principle and Methods: Design Fundamentals, Design Principles, Effective Modular Design, Design Representations, Architectural Design, Procedural Design, Data Directed design, Real Time Design, Object Oriented Design, Coupling and Cohesion.

Unit - IV

Software Metrics, Project Management and Estimation: Metrics in Process and Project Domains, Software Measurement, Software Quality Metrics, **Project Management**- Basics-People, Product, Process, Project, **Estimation**- Software Project Estimation, Decomposition Techniques- Function Point Estimation, Line of Code (LOC) Based estimation, Empirical Estimation, COCOMO Model, Project Scheduling Techniques.

Unit - V

Software Testing: Definitions, Software Testing Life Cycle (STLC), , Test Case Design, Strategic Approach to Software Testing- Verification & Validation , Strategic Issues, Criteria for Completion of Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Black Box Testing Techniques, White Box Testing Techniques, Acceptance Testing.

RECOMMENDED BOOKS

- Software Engineering, Sommerville, Pearson.
- Software Engineering: A Practitioner's Approach, Roger S. Pressman, McGraw Hill.
- Software Engineering, K.K. Agrawal & Yogesh Singh, New Age Publication.
- Software Engineering, Rajib Mall, PHI.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the various fundamental concepts of software engineering.

CO2. develop the concepts related to software design & analysis.

CO3. compare the techniques for software project management & estimation.

CO4. choose the appropriate model for real life software project.

CO5. design the software using modern tools and technologies.

CO6. test the software through different approaches.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IOT ARCHITECTURE & PROTOCOLS

230404

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- Familiarize the student with the basic taxonomy and terminology of the IOT Architecture & Protocols.
- Provide detailed knowledge about various layers, protocols and devices that facilitate IoT service.

Unit-I

Introduction: IoT architecture outline, standards - IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, IoT Communication models, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics

Unit-II

IoT Reference Architecture: Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints.

Unit-III

IoT Data Link Layer & Network Layer Protocols: PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, ZWave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4,IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP.

Unit-IV

IoT Transport & Session Layer Protocols: Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS), Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT.

Unit-V

IoT Service Layer Protocols & Security Protocols: Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC802.15.4 , 6LoWPAN, RPL, Application Layer: UPnP, SCADA, Authentication Protocols.

RECOMMENDED BOOKS

- Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, Daniel Minoli, ISBN: 978-1-118-47347-4, Willy Publications ,2016
- From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand,Stamatis Karnouskos, David Boyle, 1st Edition, Academic Press, 2015.
- Architecting the Internet of Things, Bernd Scholz-Reiter, Florian Michahelles, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016
- Sensors, Actuators and Their Interfaces, N. Ida, Scitech Publishers, 2014.
- IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, CISCO Press, 2017
- Internet of Things: Architectures, Protocols and Standards , Simone Cirani , Gianluigi Ferrari , Marco Picone , Luca Veltri, Willy Publications ,2018.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the fundamental concepts of IoT Architecture.

CO2. illustrate the basic taxonomy & terminologies of IoT communication protocols.

CO3. develop a concept for understanding IoT technologies.

CO4. build the skill for establishing communication among IoT devices.

CO5. analyze various IoT Application layer Protocols in IoT.

CO6. design IoT-based systems for real-world problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

NETWORK & WEB SECURITY
230405/240405/270405/280405

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To provide conceptual understanding of network security principles, issues, challenges and mechanisms.
- To understand how to apply encryption techniques to secure data in transit across data networks.
- To explore the requirements of real-time communication security and issues related to the security of web services.

Unit-I

Security: Principles and Attacks, Basic Number Theory: Prime Number, Congruence's, Modular Exponentiation, Fundamentals of Cryptography, Steganography, Cryptanalysis, Code Breaking, Block Ciphers and Steam Ciphers, Substitution Ciphers, Transposition Ciphers, Caesar Cipher, Play-Fair Cipher, Hill Cipher, Cipher Modes of Operation.

Unit-II

Cryptography: Symmetric Key Cryptography, Public Key Cryptography, Principles of Public Key Cryptosystem, Classical Cryptographic Algorithms: DES, RC4, Blowfish, RSA, Distribution of Public Keys and Key Management, Diffie-Hellman Key Exchange.

Unit-III

Hash Functions: Hash Functions, One Way Hash Function, SHA (Secure Hash Algorithm), Authentication: Requirements, Functions, Kerberos, Message Authentication Codes, Message Digest: MD5, SSH (Secure Shell), Digital Signatures, Digital Certificates.

Unit -IV

IP & Web Security Overview: SSL (Secure Socket Layer), TLS (Transport Layer Security), SET (Secure Electronic Transaction). IDS (Intrusion detection system):

Statistical Anomaly Detection and Rule-Based Intrusion Detection, Penetration Testing, Risk Management. Firewalls: Types, Functionality and Polices.

Unit -V

Phishing: Attacks and its Types, Buffer Overflow Attack, Cross Site Scripting, SQL Injection Attacks, Session Hijacking. Denial of Service Attacks: Smurf Attack, SYN Flooding, Distributed Denial of Service. Hacker: Hacking and Types of Hackers, Foot Printing, Scanning: Types: Port, Network, Vulnerability), Sniffing in Shared and Switched Networks, Sniffing Detection & Prevention, Spoofing.

RECOMMENDED BOOKS

- Cryptography and Network Security, William Stallings, Pearson Education.
- Cryptography and Network Security, Atul Kahate, McGraw Hill Education.
- Incident Response and Computer Forensics, Kevin Mandia, Chris Prosise, Tata McGraw Hill.

COURSE OUTCOMES

After completion of the course students would be able to:

CO1. explain cryptographic algorithms, hash algorithms and authentication mechanisms.

CO2. illustrate fundamentals of number theory, attacks and security principles.

CO3. apply number theory and various algorithms to achieve principles of security.

CO4. analyze the cause for various existing network attacks and describe the working of available security controls.

CO5. examine the vulnerabilities in IT infrastructure.

CO6. predict the attacks and controls associated with IP, transport-level, web and e-mail security.

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DEPARTMENT OF INFORMATION TECHNOLOGY

PYTHON PROGRAMMING LAB

160414/230406

L	T	P	Total Credits
-	1	2	2

COURSE OBJECTIVES

- Implement an algorithm in Python by using standard programming constructs such as, functions, modules, aggregated data (arrays, lists, etc.)
- Explain the output of a given Python program and identify and correct errors in a given Python program
- Write programs using the features of object-oriented programming language such as, encapsulation, polymorphism, inheritance, etc.

Unit-I

Introduction to Python programming language Data and Expressions: Literals; Variables and Identifiers; Operators; Expressions and Data Types, Logical operator; Boolean operator; Boolean Expressions; Control Structures; Selection Control, Iterative Control. Lists & tuples: List Structures; Lists in Python, Iterating over Lists in Python.

Unit-II

Functions: Arguments in functions; Program routes; Calling Value Returning Functions; Calling Non- value Returning Functions Parameter Passing; Variable Scope; Modular design Modules; Top-Down Design Python Modules; File Handling Operation in file: Reading, Writing and appending in Text Files.

Unit-III

String Processing; Dictionaries and sets operations; Exception Handling: Exceptions Data Collections applying lists etc.

Unit-IV

Introduction to Object Oriented Programming, Class, Objects, Encapsulation, Data abstraction, Inheritance, Polymorphism.

Unit-V

Graphics Programming: Graphics Programming, Using Graphical Objects, Interactive Graphics, Displaying Images, Generating Colors, Graphics Objects, Entry Objects, Test Case: Numpy, scipy; Test Case: panda, Matplotlib.

RECOMMENDED BOOKS

- C. Dierbach, Introduction to Computer Science Using PYTHON: A Computational Problem-Solving Focus (1st ed.), Wiley, 2015. ISBN 978-8126556014.
- Yashavant Kanetkar, Let Us Python (1st ed.), BPB Publishers, 2019. ISBN 978-9388511568

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. solve computational problem using python language

CO2. familiar with basics syntax and features of python programming language

CO3. hands on experience to online coding tools like colab.

CO4. design a program utilizing the features of object oriented concept.

CO5. utilize some of the libraries available for solving problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER ARCHITECTURE AND MICROPROCESSOR
230401/240401/270401/280401

LIST OF EXPERIMENT

1. Write an assembly language program to perform the subtraction of two 8-bit numbers using the 8085/8086 instruction set.
2. Write an assembly language program to move data blocks starting at location 'X' to location 'Y' without overlap using the 8085/8086 instruction set.
3. Write an assembly language program to move data blocks starting at location 'X' to location 'Y' with overlap using 8085/8086 instruction set.
4. Write an assembly language program to arrange a set of 8-bit numbers starting at location in ASCENDING/DESCENDING order. Display the stored vector in the address data field using the 8085/8086 instruction set.
5. Write an assembly language program to perform the multiplication of two 8-bit numbers using the 8085/8086 instruction set.
6. Write an assembly language program to perform the division of two 8-bit numbers using the 8085/8086 instruction set.
7. Write an assembly language program to find the larger number in an array of data using the 8085/8086 instruction set.
8. Write an assembly language program to convert two BCD numbers in memory of the equivalent HEX number using the 8085/8086 instruction set.
9. Write an assembly language program to convert a given hexadecimal number into its equivalent BCD number using the 8085/8086 instruction set.
10. Write an assembly language program to convert a given hexadecimal number into its equivalent ASCII number using the 8085/8086 instruction set.
11. Write an assembly language program to convert a given ASCII character into its equivalent hexadecimal number using the 8085/8086 instruction set.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain types of instructions and addressing modes.

CO2. make use of Hex code needed in assembly language

CO3. experiment with various peripheral devices to interface with microprocessors.

CO4. simplify the arithmetic, Logical, etc. problems using the instruction set of 8086/8085 microprocessors.

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DEPARTMENT OF INFORMATION TECHNOLOGY

SOFTWARE ENGINEERING LAB
160412/230403/240403/270403/280403

LIST OF EXPERIMENTS

Experiment 1: Identify the requirements from problem statements
Requirements, Characteristics of Requirements, Categorization of Requirements, Functional Requirements, Identifying Functional Requirements

Experiment 2: Estimation of project metrics using estimation techniques like COCOMO model
Project Estimation Techniques, COCOMO, Basic COCOMO Model, Intermediate COCOMO Model, Complete COCOMO Model, Advantages of COCOMO, Drawbacks of COCOMO, Halstead's Complexity Metrics

Experiment 3: Modeling UML Use Case diagrams and capturing Use Case Scenarios
Use case diagrams, Actor, Use Case, Subject, Graphical Representation, Association between Actors and Use Cases, Use Case Relationships, Include Relationship, Extend Relationship, Generalization Relationship, Identifying Actors, Identifying Use cases, Guidelines for drawing Use Case diagrams

Experiment 4: E-R modeling from the problem statements
Entity Relationship Model, Entity Set and Relationship Set, Attributes of Entity, Keys, Weak Entity , Entity Generalization and Specialization , Mapping Cardinalities , ER Diagram, Graphical Notations for ER Diagram , Importance of ER modeling

Experiment 5: Modeling UML Class diagrams and Sequence diagrams
Structural and Behavioral aspects, Class diagram, Elements in class diagram, Class, Relationships, Sequence diagram, Elements in sequence diagram, Object, Life-line bar, Messages

Experiment 6: Modeling Data Flow diagrams
Data Flow Diagram, Graphical notations for Data Flow Diagram, Explanation of Symbols used in DFD, Context diagram and leveling DFD

Experiment 7: Create flow chart for an algorithm using Raptor
Assignment, Call, Input, Output, Selection and Loop symbols.

Experiment 8: Estimation of Test coverage metrics and structural complexity
Control Flow Graph, Terminologies, McCabe's Cyclomatic Complexity, Computing Cyclomatic Complexity, Optimum Value of Cyclomatic Complexity, Merits, Demerits.

Experiment 9: Designing Test Suites
Software Testing , Standards for Software Test Documentation , Testing Frameworks , Need for Software Testing .Test Cases and Test Suite , Types of Software Testing , Unit Testing , Integration Testing , System Testing , Example , Some Remarks.

RECOMMENDED TOOLS

- Selenium
- Star UML

- UMLet
- Raptor

REFERENCE

- Virtual Labs (http://vlabs.iitkgp.ernet.in/se/)

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. demonstrate the basic concept of UML.

CO2. discuss the software development process using different tools.

CO3. display the various ways for solving different common modelling problems using UML.

CO4. use the knowledge of Software engineering and project management.

CO5. identify the vocabulary, rules and idioms of the UML and learn how to model it effectively.

CO6. design the software systems using software engineering concepts.

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DEPARTMENT OF INFORMATION TECHNOLOGY

PYTHON PROGRAMMING LAB

160414/230406

LIST OF PROGRAMS

1. Write a program to demonstrate different number data types in python.
2. Write a program to perform different arithmetic operations on numbers in python.
3. Write a program to create, concatenate and print a string and accessing substring from a given string.
4. Write a python program to create, append and remove lists in python.
5. Write a program to demonstrate working with tuples in python.
6. Write a program to demonstrate working with dictionaries in python.
7. Write a python program to find the factorial of a number using recursion.
8. WAP to swap two integers without using a third variable. The swapping must be done in a different method in a different class.
9. WAP to find the greater of two given numbers in two different classes using friend function.
10. Write a python program to define a module and import a specific function in that module to another program.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. write, test, and debug simple Python programs.

CO2. solve computational problem using python language.

CO3. familiar with basics syntax and features of python programming language.

CO4. use Python lists, tuples, dictionaries for representing compound data.

CO5. design a program utilizing the features of object oriented concept.

CO6. utilize some of the libraries available for solving problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

COMPUTER ARCHITECTURE AND MICROPROCESSOR
230401/240401/270401/280401

LIST OF SKILL BASED MINI PROJECT

1. Design an interface Temperature Controller using microprocessor 8085/8086.
2. Design a Traffic light controller using 8085/8086 microprocessor.
3. Design a Night light saver using 8085/8086 microprocessor.
4. Design an interfacing with Stepper Motor controller using 8085/8086 microprocessor.
5. Design an interfacing with DC motor controller using 8085/8086 microprocessor.
6. Design an Interfacing with keypad using 8085/8086 microprocessor.
7. Design an interfacing with LED's using 8085/8086 microprocessor.
8. Design an interfacing with switches using 8085/8086 microprocessor.
9. Design an interfacing with ADC using 8085/8086 microprocessor.

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DEPARTMENT OF INFORMATION TECHNOLOGY

SOFTWARE ENGINEERING LAB
160412/230403/240403/270403/280403

LIST OF SKILL BASED MINI PROJECT

Note: In every project students must have to

- **Design the SRS of the project.**
- **Draw the various ER diagram, DFD and Use Case diagram of the project.**
- **Design the test case of the project.**

Mini Skill Project 01

Delivery Agent System

There are many online shopping portals such as Flipkart, Amazon, Snapdeal, etc. are active in the Indian market. One major task is to deliver an online books T-shirt to the customers as first as possible in a cost-effective (cheapest) manner. A delivery agent system, which would automatically receive a delivery request from an online portal and identify the couriers, whom the delivery job can be assigned.

Input:
- Shipping details (source and destination) locations
- Couriers' details in different localities.
- Service offering for each courier company.

Functions:
- Booking delivery
- Status of delivery
- Cancellation of booking

Output:
- Booking confirmation, if booking is successful.
- Reporting delivery status
- Cancellation of booking confirmation

Mini Skill Project 02

Payroll Management System (PMS)

The Employee and Payroll Systems objective is to provide a system which manages the employee details, the Payroll activity done in a company depending upon the employees attendance and its calculation which is very huge. The users will consume less amount of time through computerized system rather than working manually. The system will take care of all the payroll activities like managing each employee's attendance, the number of leaves taken by that particular employee and calculation in a very quick manner and it avoids Data storing is easier. Paper work will be reduced and the company staffs spend more time on monitoring the progress. The system is user friendly and easy to use. All the important data's will be stored in the database and it avoids any miscalculation. The "Employee and Payroll System "is based on maintaining each employee records and calculating his/her salary depending on the workdays. The first activity is based on saving the employees details where each employee will be given a unique Employee ID. Now based on the no of days an employee attended per month,

salary will be calculated by checking the no of workdays of a company and his/her basic salary and a separate salary slip will be provided for reference.

Inputs:

- Employee details (employee no, name, address, designation, department, achievements)
- Accounts details (salary of each employee, deduction, TA, DA, HRA, other allowance, PF)
- Leave information (no of leave taken by each employee)

Output:

- Salary slip
- Detailed salary report
- Deduction details
- Leave information

Mini Skill Project 3

Online Toll Plaza System

Now-a-days, cashless transaction is becoming popular among the users because it is easy to handle, and it does not require to carry cash in hand. Typically, in India, road tolls are collected from cars manually for which the cars need to stop to pay the toll fee. In contrast, the objective is to make the system Online, so that the toll fee is automatically deducted from the user. Therefore, users credit their Online account (consider this as eWallet), and money is automatically deducted when the cars pass the toll system. As a result, the users do not have to wait for manual toll fee payment. Concurrently, administrator can also view all transactions from anywhere. Finally, the administrator can view the total income in a day-to-day basis, and can also analyze the traffic pattern as well.

Inputs:

- User Information (Name, Car Number, Email Address, Password, Money in eWallet)
- Administrator Information (Email Address, Password)

Operations:

- User
  - Log-In
  - Credit in eWallet
  - Check eWallet Balance
  - Log-Out
- System
  - Check the car number
  - Required Fee Available
  - Allow the car to pass
  - Deduct money from eWallet
  - Required Fee NOT Available
  - Do Not Allow the car to pass
  - Fee Payment is done manually
  - Allow the car to pass
  - Total Income is stored in a database
- Administrator
  - Log-In

- View transactions
- View total income

Outputs:

- Display day-wise transactions to administrator
- User can view his/her own transactions

Mini Skill Project 04

Online Examination System

Now-a-days, Online examination system has become popular for competitive examinations because of its unique features such as auto-evaluation, speed and accuracy. Moreover, it also helps environments by reducing the use of paper. In such a system, students are asked to select answers from multiple options given for a single question. Likewise, there are several questions which appear in the students' systems. The questions and multiple options are saved in a database along with desired answers. Typically, a student can edit an answer after saving it, however, editing cannot be done after submitting the answer. Another user is also there – administrator. The administrator can create, modify and delete questions and accordingly, the question is updated in the system.

Inputs:

- Subject Information with Code, so that all subjects can be identified using unique codes.
- User Information
- If Student- Student Information (Name, Roll No, Email Address, Contact Number, Password)
- If Administrator (Email Address, Password)
- Set of Questions with multiple answers for each stored in a database along with desired answers.

Operations:

- Administrator
  - Log-In
  - CREATE, MODIFY or DELETE questions. Accordingly, the question set must be updated.
  - Log-Out
- Student
  - Log-In (Time starts)
  - Answer the questions – SAVE and SUBMIT
  - Log-Out (Automatically logged out after Timeout)

Outputs:

- Display the result in DESCENDING order according to obtained marks with Roll Number.
- The result is also saved into a database for future use.

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DEPARTMENT OF INFORMATION TECHNOLOGY

Mini Skill Project 5

Online Health Monitoring System

Online health monitoring or Online patient monitoring system (OHMS) is a promising technology to enable patient monitoring outside the conventional clinical system, i.e., the patient can be monitored remotely. Consequently, such system increases the access to care the patients and decreases the delivery cost related to healthcare. Typically, in OHMS, two type of users are there – doctors and patients. Different physiological parameters of the patient are monitored (using sensors), and the monitored data is stored in a server. The stored data is accessible from anywhere through user authentication. On the other hand, doctors can check the health status of a patient registered with the doctor. Therefore, the doctor can only access the physiological data of a patient if and only if he/she is registered with the doctor. Depending on the monitored values, adequate measures can be taken by the doctors. The patient can also view his/her health status. For authenticity, both the users need to login into the system.

Inputs:

- User Information
- Doctor – (Name, Email Address, Password)
- Patient – (Name, Email Address, Password, DOB)
- Predefined Sensors (such as temperature, blood pressure and heart rate)

Operations:

- Patient
  - Log-In
  - View health status
  - Ask doctor(s) to consult
  - Payment (Consultancy Fee)
  - Log-Out
- Doctor
  - Log-In
  - Monitor health status of registered patients to him/her
  - Ask patient(s) to consult
  - Log-Out

Outputs:

- Display health status
- Consult with doctors/patients

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DEPARTMENT OF INFORMATION TECHNOLOGY

PYTHON PROGRAMMING LAB

160414/230406

LIST OF SKILL BASED MINI PROJECT

1. Implement a calculator using Tkinter library.
2. Design and implementation of Animal Kingdom Classification.
3. Design and implementation of a real-time, User friendly Currency Converter.
4. Design and implementation of a File Manager which supports various types of files.
5. Design a program for Number Guessing using random number generator library. Make a play game with the defined library.
6. Design any game of your choice like tic-tac-toe etc.
7. Implement a contact book (command line project) capable of storing user data like name, address, phone number, email etc. Use any database for storing the information so that updation and deletion can also be carried out.
8. Implement binary search algorithm by creating a list from random numbers between any predefined ranges.
9. Design a program for spam filtering.
10. Design a dice rolling simulator generating random number from 1 to 6 every time dice is rolled.
11. Implement countdown clock and timer.

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DEPARTMENT OF INFORMATION TECHNOLOGY

THEORY OF COMPUTATION
160513/230503/240503/270503/280503

L	T	P	Total Credits
2	1	2	4

COURSE OBJECTIVE

- To understand computability, decidability, and complexity through problem solving.
- To analyse and design abstract model of computation & formal languages
- To understand and conduct mathematical proofs for computation and algorithms.

Unit-I

Introduction of Automata Theory: Examples of automata machines, Finite Automata as a language acceptor and translator, Moore machines and mealy machines, composite machine, Conversion from Mealy to Moore and vice versa.

Unit-II

Types of Finite Automata: Non Deterministic Finite Automata (NDFA), Deterministic finite automata machines, conversion of NDFA to DFA, minimization of automata machines, regular expression, Arden's theorem. Meaning of union, intersection, concatenation and closure, 2 way DFA.

Unit-III

Grammars: Types of grammar, context sensitive grammar, and context free grammar, regular grammar. Derivation trees, ambiguity in grammar, simplification of context free grammar, conversion of grammar to automata machine and vice versa, Chomsky hierarchy of grammar, killing null and unit productions. Chomsky normal form and Greibach normal form.

Unit-IV

Push down Automata: example of PDA, deterministic and non-deterministic PDA, conversion of PDA into context free grammar and vice versa, CFG equivalent to PDA, Petrinet model.

Unit-V

Turing Machine: Techniques for construction. Universal Turing machine Multitape, multihead and multidimensional Turing machine, N-P complete problems. Decidability

and Recursively Enumerable Languages, decidability, decidable languages, undecidable languages, Halting problem of Turing machine & the post correspondence problem.

RECOMMENDED BOOKS

- Introduction to Automata Theory Language & Computation, Hopcroft & Ullman, Narosa Publication.
- Element of the Theory Computation, Lewis & Christors, Pearson.
- Theory of Computation, Chandrasekhar & Mishra, PHI.
- Theory of Computation, Wood, Harper & Row.
- Introduction to Computing Theory, Daniel I-A Cohen, Wiley.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the basic concepts of switching and finite automata theory & languages.

CO2. relate practical problems to languages, automata, computability and complexity.

CO3. construct abstract models of computing and check their power to recognize the languages.

CO4. analyze the grammar, its types, simplification and normal form.

CO5. interpret rigorously formal mathematical methods to prove properties of languages, grammars and automata.

CO6. develop an overview of how automata theory, languages and computation are applicable in engineering application.

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DEPARTMENT OF INFORMATION TECHNOLOGY

SOFT COMPUTING TECHNIQUES
160515/230505/240505

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To provide the student with the basic understanding of neural networks and fuzzy logic fundamentals, Program the related algorithms and Design the required and related systems.
- To understand the fundamental theory and concepts of neural networks, several neural network paradigms and its applications.
- To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

Unit-I

Introduction to Soft Computing: Soft Computing v/s Hard Computing, Basic models of Artificial Neural Networks, Terminologies of ANNs McCulloch-Pitts Neurons, Linear Separability, Hebb Network, Supervised Learning Networks: Introduction, Perceptron Networks, Back Propagation Networks, Radial Basis Function Networks, Hopefield networks.

Unit-II

Fuzzy Set Theory: Fuzzy Sets, Fuzzy Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations, Fuzzy rules, Fuzzy Reasoning, Defuzzification: Lembda-Cuts for Fuzzy sets (Alpha-Cuts), Lembda-Cuts for Fuzzy Relations. Fuzzy Inference System: Introduction, Mamdani Fuzzy Model, Takagi-Sugeno Fuzzy Model.

Unit-III

Evolutionary Algorithm: Traditional optimization and Search Techniques, Basic Terminologies in GA, Operators in Genetic Algorithm, Stopping Condition for Genetic Algorithm Flow, Classification of Genetic Algorithm, Comparison with Evolutionary algorithm, Application of Genetic algorithm.

Unit-IV

Introduction to Nature-Inspired Optimization Algorithms: Particle Swarm Optimization (PSO) Algorithm, Differential Evolution (DE) Algorithm, Artificial Bee

Colony (ABC) Algorithm, Ant Colony Optimization (ACO) Algorithm, Cuckoo Search (CS), Firefly Algorithm (FA), Immune Algorithm (IA), Grey Wolf Optimization (GWO), Spider Monkey Optimization.

Unit-V

Hybrid Soft Computing Techniques: Introduction, Neuro-fuzzy Hybrid system, Adaptive Neuro fuzzy inference system(ANFIS), Genetic Neuro Hybrid system, Application of Soft Computing Techniques.

RECOMMENDED BOOKS

- Principles of Soft Computing, S. N. Sivanandam and S. N. Deepa , Wiley Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications- S. Rajasekaran & G.A. Vijayalakshmi Pai, PHI.
- Introduction to Soft Computing Neuro-Fuzzy and Genetic Algorithms, Samir Roy and Udit Chakraborty, Pearson.
- Neural Networks and Learning Machines-Simon Haykin PHI.
- Fuzzy Logic and Engineering Application, Tomthy Ross, TMH.
- Evolutionary Optimization Algorithms, D. Simon (2013), Wiley.
- Fundamentals of Natural Computing: Basic Concepts, Algorithms, and Applications, L. N. de Castro (2006), CRC Press.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define basic concepts of neural network and fuzzy systems.

CO2. compare solutions by applying various soft computing approaches on a given problem.

CO3. develop and train different supervised and unsupervised learning.

CO4. classify various nature inspired algorithms according to their application aspect.

CO5. compare the efficiency of various hybrid systems.

CO6. design a soft computing model for solving real world problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DISCRETE STRUCTURES
230501/240501

L	T	P	Total Credits
2	1	-	3

COURSE OBJECTIVES

- To perceive the knowledge of basic algebra
- To describe function and its relation
- To familiarize propositional logic
- To know about the graph theory and its application in computer engineering
- To familiarize the discrete numeric function and generating function

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Unit-I

Finite and Infinite Sets, Mathematical Induction, Principles of Inclusion and Exclusion, Multisets, Functions and Relations, Binary Relations, Equivalence Relations and Partitions, Partial Ordering Relations and Lattices, Chains, Pigeonhole Principle.

Unit-II

Prepositional Logic, Syntax, Semantics of ATF (Atomic Formula), WFF (Well Formed Formula's),Validity and Satisfiability of WFF by Quine's Method, Normal and Closure Form of Prepositional Calculus.

Unit-III

Introduction and Basic Terminology of Graphs, Planner Graphs, Multi-Graphs and Weighted Graph, Shortest Path in Weighted Graph, Introduction to Eularian Paths and Circuits, Hamiltonian Paths and Circuits, Introduction to Trees, Rooted Trees, Path Length in Rooted Trees, Spanning Trees and Cut Trees.

Unit-IV

Introduction to Discrete Numeric Functions and Generating Functions, Recurrence Relations and Recursive Algorithms, Linear Recurrence Relations with Constant Coefficients, Homogeneous Solutions, Particular Solutions and Total Solutions.

Unit-V

Introduction to Group, Subgroups, Generations and Evaluation of Power, Cosets and Lagrange's Theorem, Group Codes, Isomorphism and Automorphism, Homomorphism and Normal Sub Groups, Ring, Integral Domain and Field.

RECOMMENDED BOOKS

- J. Tremblay and Manohar: Discrete Mathematical Structures with Application to Computer science. Narsingh Deo: Graph Theory.
- Kenneth Rosen: Discrete mathematics and its applications (6th edition).2006. McGraw-Hill
- C. Liu, D. Mohapatra: Elements of Discrete Mathematics. 2008. Tata McGraw-Hill.
- T. Koshy: Discrete mathematics with applications.2003. Academic Press.
- J. Hein: Discrete structures, logic and computability.2009. Jones & Bartlett Publishers.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. explain the basic concept of set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure.

CO2. illustrate the knowledge of course content and distinguish between them in terms of their applications.

CO3. identify the concepts of graph and tree for solving problems in the computer science.

CO4. apply the concepts of studied topics with suitable technique faced in engineering problems.

CO5. analyze the set theory, prepositional logic, graph theory, discrete numeric function and algebraic structure to examine the real world problem.

CO6. build analytical skill and interpret applications of engineering beneficial in real time troubleshooting.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA SCIENCES IN IOT
230502

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To understand the key technologies in analytics for IoT.
- To understand the IoT data and requirement of analysis.
- To gain practical, hands-on experience with statistics programming languages, tools.

Unit-I

Introduction to Data Analytics: Defining IoT Analytics and Challenges: The situation, Defining IoT analytics, IoT analytics challenges, Business value concerns, IoT Analytics for the Cloud. Types of Analytics: Streaming Analytics, Spatial, Time Series and Prescriptive Analytics.

Unit-II

Data Collection: Getting to know your data, Types of Data, Data collection strategies, Data Pre-processing, Feature engineering with IoT data**,** Exploratory Data Analytics, Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis.

Unit-III

Data Visualization and Representation: Model Development Simple and Multiple Regression, Model Evaluation using Visualization, Residual Plot, Distribution Plot, Polynomial Regression and Pipelines, Measures for In-sample Evaluation, Prediction and Decision Making, Box Plots, Pivot Table, Heat Map.

Unit-IV

Strategies to Organize Data for Analytics: Linked Analytical Datasets, Linking together datasets, Managing data lakes, Data retention strategy, Economics of IoT Analytics, Cost considerations for IoT analytics, Thinking about revenue opportunities, The economics of predictive maintenance example, Data Analytics Life Cycle.

Unit-V

Application of Analytics in IoT: IoT based applications, Healthcare, Marketing, Finance, Smart cities, Cyber security, video surveillance, Agriculture and Weather Forecasting and other domains; Real Time IoT based data analysis.

RECOMMENDED BOOKS:

- Jojo Moolayil, "Smarter Decisions : The Intersection of IoT and Data Science", PACKT, 2016.
- Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
- David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013
- Andrew Minteer, Analytics for the Internet of Things "IoT" (1 ed.), Packt Publishing, 2017. ISBN 978-1787120730.
- Hwaiyu Geng, Internet of Things and Data Analytics Handbook (1st st ed.), Wiley, 2017. ISBN 978-1119173649.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define the fundamentals of data science and its importance.
CO2. classify the evolution, roles, stages in data science projects.
CO3. analyze the pre-processing and data reduction strategies.
CO4. explain the different data visualization and representation techniques.
CO5. evaluate the performance of algorithms in data science.
CO6. design the different real time applications of data science in IoT.

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DEPARTMENT OF INFORMATION TECHNOLOGY

EMBEDDED SYSTEM & IOT
230504

L	T	P	Total Credits
3	-	2	4

COURSE OBJECTIVES

- To understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions
- To learn ARM microcontrollers to perform various tasks.
- To understand the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices.

Unit-I

Embedded and Microcontroller Concepts: Introduction to embedded processors, Application Areas, Categories of embedded processors, Hardware architecture, Software architecture, Application software, Communication software, Introduction to Harvard & Von Neumann Architectures, CISC & RISC Architectures.

Unit-II

Embedded Serial Communication: SPI, SCI (RS232, RS485), I2C, CAN, Field-bus (Profibus), USB. Communication under IoT: IoT Protocol: MQTT, CoAP, XMPP and AMQT, IoT Communication Models, IoT Communication Technologies: Bluetooth, BLE, Zig-Bee, Zwave, NFC, RFID, LiFi, Wi-Fi, Interfacing of Communication Technologies, Embedded Programming.

Unit-III

ARM: ARM design philosophy, data flow model and core architecture, registers, program status register, instruction pipeline, interrupts and vector table, operating modes and ARM processor families. Instruction Sets: Data processing instructions, addressing modes, branch, load, store instructions, PSR instructions, and conditional instructions.

Unit-IV

Raspberry Pi: Raspberry Pi board and its processor, Programming the Raspberry Pi, Communication facilities on Raspberry Pi (I2C, SPI, UART), Interfacing of sensors and actuators.

Unit-V

Intel Galileo or Edison microprocessors for Embedded System and IoT, Application-specific integrated circuit (ASIC), Application-specific standard parts (ASSPs), System-on-Chip (SoC), Field-Programmable Gate Arrays (FPGA), Single Board Computers (SBC).

RECOMMENDED BOOKS

- Muhammod Ali Mazidi, Rolin D. Mckinlay & Danny Sansey, "PIC Microcontroller and Embedded System SPI, UART using Assembly & C for PICI8," Pearson International Edition, 2008.
- A. N. Sloss, D. Symes, and C. Wright, "ARM System Developer's Guide: Designing and Optimizing System Software", Elsevier, 2008.
- S. Monk, "Programming the Raspberry Pi" McGraw-Hill Education, 2013
- John .B. Peatman, "Design with PIC Microcontroller", Prentice Hall, 1997.
- Steave Furber, "ARM system-on-chip architecture", Addison Wesley, 2000.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define the basic concepts of embedded systems and microcontroller.

CO2. explain the architecture and advanced features of embedded processors and microcontrollers.

CO3. utilize the PIC/ARM processor registers, instruction pipeline, interrupts and architecture.

CO4. examine the instructions, addressing modes, conditional instructions and programming of advanced embedded processors and microcontrollers.

CO5. analyze the architectures, instructions, interfacing and applications of Raspberry Pi board.

CO6. elaborate the advanced intel Galileo or Edison microprocessors for embedded systems for IoT.

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DEPARTMENT OF INFORMATION TECHNOLOGY

THEORY OF COMPUTATION
160513/230503/240503/270503/280503

LIST OF PROGRAMS

1. Design a Program for creating machine that accepts three consecutive one.
2. Design a Program for creating machine that accepts the string always ending with 101.
3. Design a program for accepting decimal number divisible by 5.
4. Design a Program for creating machine, which accepts 2 Mod 3.
5. Design a program for creating a machine, which accepts even of 1's and 0's.
6. Design a Program to find 2's complement of a given binary number.
7. Design a Program, which will increment the given binary number by 1.
8. Design a Program to convert NDFA to DFA.
9. Design a program to create PDA to accept $a^n b^n$ where n>0.
10. Design a Program to create PDA machine that accept the well-formed parenthesis.
11. Design a program to create PDA to accept WCWR where w is any string, WR is reverse of that string, and C is a Special symbol.
12. Design a Turing machine that accepts the following language an $b^n c^n$ where n>0.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. judge various computational models.

CO2. construct abstract models of computing.

CO3. justify the power of abstract models in computing to recognize the languages.

CO4. demonstrate analytical thinking and intuition for problem solving in the related areas.

CO5. discuss the limitations of computation in problem solving.

CO6. follow set of rules for syntax verification.

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DEPARTMENT OF INFORMATION TECHNOLOGY

THEORY OF COMPUTATION
160513/230503/240503/270503/280503

LIST OF SKILL BASED MINI PROJECT

Note: Use JFLAP (Java Formal Languages and Automata Package) tools.

List of Micro Projects:

1. Study of JFLAP (Java Formal Languages and Automata Package) tools
2. Create Deterministic Finite Automata (DFA)
3. Create Nondeterministic Finite Automata (NFA)
4. Perform Conversion of NFA to DFA
5. Perform DFA Minimization
6. Design a Program for creating machine that accepts three consecutive one.
7. Design a machine that performs DFA to regular grammar conversion.
8. Design a machine that performs DFA to regular expression conversion.
9. Design a machine that performs Regular expression to DFA conversion.

List of Macro Projects:

1. Design DFA which check whether the given unary number is divisible by 5.
2. Design DFA which checks whether the given number is even.
3. Design DFA for the string that always end with 00 using JFLAP tool.
4. Design DFA which accepts only those string which start with 1 and end with 0.
5. Design DFA which accepts even number of 0's and 1's.
6. Design a Moore machine to generate 1's complement of given binary number.
7. Design a Melay machine to generate 2's complement of given binary number.
8. Design a Moore machine which will increment the given binary number by 1.
9. Design a Melay machine for the input symbol 0,1,2 and print residue modulo of 7 of input treated as ternary number.

List of Mini Projects:

1. Design a machine that takes input NDFA and coverts it into DFA.
2. Design a Turing Machine that calculate 2's complement of given binary string.
3. Design a Turing Machine, which will increment the given binary number by 1.
4. Design a Turing Machine that's accepts the following language $a^nb^nc^n$ where n>0.
5. Design a Turing Machine to accept WR where w is any binary string and WR is reverse of that string.
6. Construct a machine to recognize signed or unsigned decimal number.

7. Construct a machine to recognize string, which ends with Gwalior or Bhopal.
8. Design a machine which accept at least single a followed by at least single b followed by at least single c.
9. Design a machine that will read sequence made up of letter A,E,I,O,U and will give as output the same sequences except that in case where an I directly follows an E, it will be changed to u.
10. Design a machine for binary input sequence such that if it has substring 101 the machine outputs A if input has substring 110 it outputs B otherwise it Output C.
11. Design a machine which accepts the string consist of a & b in which number of a's are more than number of b's.
12. Design a machine which accepts the string consist of a & b in which number of a's are less than number of b's.
13. Construct a machine for checking the palindrome of the string of even length.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA SCIENCES IN IOT
230503

LIST OF PROGRAMS

1. Explore python built-in modules such as os, random, math and statistics.
2. Write a python program to perform descriptive statistics such as Central Tendency Measures (Mean, Median and Mode), Measure of Dispersion (Variance, Standard Deviation), Skewness and Kurtosis.
3. Study of data science libraries such as Numpy, Pandas etc. for Numerical computations and data manipulation.
4. Explore about data visualization libraries such as Matplotlib, Seaborn etc. in python.
5. Write a python script to draw Correlation matrix, Box plot (show Outliers), Heat map, histogram and Distribution Plot for any Dataset.
6. Write a program to perform Exploratory Data Analysis over any Dataset.
7. Write a program to implement Simple Linear Regression model for any Dataset in Python.
8. Write a program to implement Multiple Linear Regression model for any Dataset in Python.
9. Write a program to implement Logistic Regression model over any Dataset in Python.
10. With the help of classification algorithm, classify any suitable dataset available over the trusted repository.

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DEPARTMENT OF INFORMATION TECHNOLOGY

DATA SCIENCE IN IoT
230502
LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Write a python script to demonstrate how to read different types of data sets (.txt, .csv etc) from website or disk.
2. Write a python program to calculate the variance.
3. Write a script to create a normal curve using python.
4. Draw bar plot and pie plot for any dataset.
5. Write a Program in Python to Join Two Data Frames.
6. Write a python program to find NaN and Null value and replace with any number.
7. Write a python program to calculate Interquartile range (IQR).
8. Write a python program to compute correlation coefficient.
9. Write a program to create a data frame using a list of elements.
10. Write a program to calculate Z-Score for any data.

List of Macro Projects:

1. Write a program to show how to apply normalization and standardization in a given dataset.
2. Write a program to identify the missing value in any dataset and how to handle and replace it.
3. Write a program to show binary hot encoding in any dataset.
4. Write a program to show multiclass encoding in any dataset.
5. Write a python program to count the frequency of occurrence of a word (Frequency distributions) in a body of text.
6. Write a python program to draw correlation matrix.
7. Write a program to draw residual Plot for any data.
8. Write a program to show various distributions of Data over any Dataset.
9. Write a program to compute weighted averages in Python either defining your own functions or using Numpy.
10. Write a program to plot a scatter plot and Pivot table of a given data.

List of Mini Projects:

1. Consider any Dataset from online repository to design and implement a Price prediction problem.

2. Consider any Dataset from online repository to design and implement a problem using Linear Regression.
3. Consider any Dataset from online repository to design and implement a problem using Logistic Regression.
4. Consider any Dataset from online repository and perform Data pre-processing steps (including data wrangling and visualization).
5. Consider any Dataset from online repository and demonstrate working of various feature selection and normalization techniques.
6. Consider any Dataset of IoT devices and find out important insights from Data.
7. Design and implement weather forecasting system.
8. Design and implement customer prediction system.
9. Design and Implement Movie Recommendation System.
10. Design and implement House Rent prediction system.

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DEPARTMENT OF INFORMATION TECHNOLOGY

EMBEDDED SYSTEMS & IOT
230504

LIST OF PROGRAMS

1. Introduction to ARM/ RaspberryPi Boards (Installation and Setup)
2. Write a Program to read an analog input and print the voltage to the serial monitor.
3. Write a Program to Control Electronic Appliances using RELAY SHIELD Sensor.
4. Write a Program to detect presence of smoke using Smoke Sensor.
5. Write a program to interface a range sensor with an arduino board and understand the principle behind an ultrasonic range sensor.
6. Write a program to interface DHT11 and Range sensor using a single board.
7. Write a program to show sensor data (DHT11, Time, Message, Countdown) on LCD Display.
8. Write a program to demonstrate MQTT- Publish/ Subscribe concept using IoT Device.
9. Write a program to demonstrate the concept of MQTT- Broker using IoT Device.
10. Write a program to send and receive messages to IoT Devices using MQTT.
11. Write a program to demonstrate different Iot Protocols STOMP, DDS, XMPP, SSE, LwM2M or Lightweight M2M, LPWAN, CoAP, Bluetooth and WiFi etc.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. define the basic concept of Embedded System.

CO2. describe the basic principles of Arduino programming and IDE.

CO3. familiarize with different types of sensors and related systems.

CO4. design, implement, debug and test programs/ systems.

CO5. design and develop Smart systems applications.

CO6. interface different sensors to embedded boards like arduino.

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DEPARTMENT OF INFORMATION TECHNOLOGY

EMBEDDED SYSTEMS & IOT
230504

LIST OF SKILL BASED MINI PROJECT

List of Micro Projects:

1. Write a Program to Blink LED (Turn an LED on and off).
2. Write a Program to demonstrate the use of analog output to fade an LED.
3. Write a Program to count the number of buttons pushes.
4. Write a Program to Control an LED using Button.

List of Macro Projects:

1. Write a program to detect objects using IR Obstacle Sensor.
2. Write a program to detect the presence of Gas using a GAS Sensor.
3. Write a Program to measure Temperature and Humidity using DHT11 Sensor.
4. Write a program to detect motion using Motion Sensor (PIR sensor).

List of Mini Projects:

1. Design intelligent home locking system using a stepper motor (working as a lock) and nodeMCU (as a wireless transmitter and receiver) interfaced to ARM/ RaspberryPi.
2. Design Intelligent water level management system using through depth sensor the ARM/ RaspberryPi alerts the user through call by using GSM module, (NodeMCU). The proposed system evacuates the water to a storage tank through a submersible water pump.
3. Design and development of a RFID based Room Automation using microcontroller. RFID system uses Radiofrequency electromagnetic fields to transfer data from a RFID tag to identify and track the object. This system will apply Radio Frequency technology, which consists of RFID Tags, RF Readers with antennas, Arduino, transmitter- receiver, and added networking properties to identify and track objects.
4. Design and development of an loT-based smart home automation system using a microcontroller-based RaspberryPi board and mobile-based Short Message Service (SMS) application working functionality with Wi-Fi connectivity to establish communication between the ARM/ RaspberryPi module and automated home appliances.
5. Design and development Intelligent Automatic Irrigation System using an RaspberryPi, servo motor to control and sense the thing in the projects such as sense or measure the moisture in the soil we are using soil moisture sensor. The RaspberryPi sends the signals

to the relay module and the water pump is turned on for some time and can change the time by modifying the code.

6. Design and Development of Motion Detection system using Raspberry-pi / Arduino UNO, Motion Sensor.
7. Design and Development of Air Quality Monitoring System, which will provide real-time data related to the current air quality in the room through the use of sensors and microcontrollers, data will be sent to computer using MQTT protocol. Demonstrate dust density of the room in real-time on GUI.
