R23 Curriculum
CSE(IoT, Cybersecurity including Blockchain Technology)
With minor degree in AI and ML

I B. TECH – I SEMESTER

SN	Course Code	Subjects	L	T	P	Credits
1	BS&H	Communicative English	2	0	0	2
2	BS&H	Engineering Physics	3	0	0	3
3	BS&H	Linear Algebra & Calculus	3	0	0	3
4	Engineering Science	Basic Civil & Mechanical Engineering	3	0	0	3
5	Engineering Science	Introduction to Programming	3	0	0	3
6	BS&H	Communicative English Lab	0	0	2	1
7	BS&H	Engineering Physics Lab	0	0	2	1
8	Engineering Science	Engineering Workshop	0	0	3	1.5
9	Engineering Science	Computer Programming Lab	0	0	3	1.5
10	BS&H	Health and wellness, Yoga, and sports	0	0	1	0.5
11	LS	Life Skills-I	2	0	0	0
		Total Credits				**19.5**

I B. TECH - II SEMESTER

SN	Course Code	Subjects	L	T	P	Credits
1	BS&H	Chemistry	3	0	0	3
2	BS&H	Differential Equations & Vector Calculus	3	0	0	3
3	Engineering Science	Basic Electrical and Electronics Engineering	3	0	0	3
4	Engineering Science	Engineering Graphics	1	0	4	3
5	Engineering Science	IT Workshop	0	0	2	1
6	Professional Core	Data Structures	3	0	0	3
7	BS&H	Chemistry Lab	0	0	2	1
8	ES	Electrical and Electronics Engineering Workshop	0	0	3	1.5
9	PC	Data Structures Lab	0	0	3	1.5
10	BS&H	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5
11	LS	Life Skills-II	2	0	0	0
		Total Credits				**20.5**

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II B. TECH - I SEMESTER

S.No.	Category	Title	Credits
1	BS&H	Discrete Mathematics & Graph Theory	3
2	BS&H	Universal Human Values 2– Understanding Harmony	3
3	ES	Digital Logic & Computer Organization	3
4	PC	Advanced Data Structures &Algorithms Analysis	3
5	PC	Object Oriented Programming Through Java	3
6	PC	Advanced Data Structures and Algorithms Analysis Lab	1.5
7	PC	Object Oriented Programming Through Java Lab	1.5
8	SEC	Python programming	2
9	AC	Environmental Science	0
Total			**20**

SN	Course Code	Subjects	L	T	P	C
1	BS&H	Discrete Mathematics & Graph Theory	3	0	0	3
2	BS&H	Universal Human Values – Understanding Harmony	2	1	0	3
3	EC	Digital Logic and Computer Organization	3	0	0	3
4	PC	Object Oriented Programming Through Java	3	0	0	3
5	PC	Advanced Data Structures &Algorithms Analysis	3	0	0	3
6	PC	Advanced Data Structures and Algorithms Analysis Lab	0	0	3	1.5
7	PC	Object Oriented Programming Through Java Lab	0	0	3	1.5
8	SEC	Python Programming	0	1	2	2
9	Audit	Environmental Science	2	0	0	-
			15	**2**	**10**	**20**

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II B. TECH - II SEMESTER

S.No.	Category	Title	Credits
1	MC-I	Managerial Economics and Financial Analysis	2
2	ES/BS	Number Theory & Applications	3
3	PC	Operating Systems	3
4	PC	Database Management Systems	3
5	PC	Computer Networks	3
6	PC	Computer Networks & Operating Systems Lab	1.5
7	PC	Database Management Systems Lab	1.5
8	SEC	Full Stack development-1	2
9	BS&H	Design Thinking & Innovation	2
Total			**21**
Mandatory Community Service Project internship of 08 weeks duration during summer Vacation			

SN	Cat	Subjects	L	T	P	Credits
1	MC-I	Managerial Economics and Financial Analysis	2	0	0	2
2	ES/BS&H	Probability & Statistics	3	0	0	3
3	PC	Operating Systems	3	0	0	3
4	PC	Database Management Systems	3	0	0	3
5	PC	Computer Networks	3	0	0	3
6	PC	OS & Computer Networks Lab	0	0	3	1.5
7	PC	Database Systems Lab	0	0	3	1.5
8	SEC	Full Stack Web Development-1	0	1	2	2
9	BS&H	Design Thinking & Innovation	1	0	2	2
		Total Credits	**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

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III B. TECH - I SEMESTER

S.No.	Category	Title	Credits
1	Professional Core	Internet of Things	3
2	Professional Core	Cyber Security and digital forensics	3
3	Professional Core	Cryptography & Network Security	3
4	Professional Elective-I	1. Software Engineering / 2. Wireless Sensor Networks/ 3. Artificial Intelligence 4. Public Block chain - Ethereum	3
5	Open Elective- I		3
6	Professional Core	Internet of Things Lab	1.5
7	Professional Core	Cyber Security Lab	1.5
8	Skill Enhancement course	Full Stack development-2	2
9	Engineering Sciences	Tinkering Lab	1
10	Evaluation of Community Service Internship		2
	Total		23

SN	Cat	Subjects	Credits
1	PC	Internet of Things	3
2	PC	Advanced Java Programming	3
3	PC	Cryptography & Network Security	3
4	PE-I	1. Software Engineering / 2. Soft Computing/ 3. Artificial Intelligence 4. Exploratory Data Analysis with Python 5. Any of the 12-Week SWAYAM /NPTEL Course recommended by the BoS	3
5	OE- I	Data Warehousing and Data Mining	3
6	PC	Internet of Things and Network Security Lab	1.5
7	PC	Advanced programming Lab	1.5
8	SEC	Full Stack Wed development-2	2
9	ES	Tinkering Lab	1
10		Evaluation of Community Service Project	2
		Total Credits	**23**

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III B. TECH - II SEMESTER

S.No.	Cat	Title	Credits
1	PC	IoT Applications development on Cloud Platform	3
2	PC	Cloud Computing	3
3	PC	Blockchain Technology	3
4	PE-II	1. DevOps 2. Microprocessors & Microcontrollers 3. Automata Theory & Compiler Design 4. Machine Learning	3
5	PE-III	1. Software Project Management 2. Mobile Adhoc Networks 3. Natural Language Processing 4. Security Assessment and Risk Analysis	3
6	OE – II		3
7	PC	Cloud Computing Lab	1.5
8	PC	Blockchain Technology Lab	1.5
9	SEC	Soft skills OR IELTS	2
10	AC	Technical Paper Writing&IPR	0
		Total	**23**

SN	CAT	Subjects	L	T	P	Credits
1	PC	Ethical Hacking and Penetration Testing	3	0	0	3
2	PC	Cloud Computing	3	0	0	3
3	PC	Blockchain Technology	3	0	0	3
4	PE-II	1.DevOps 2.Microprocessors & Microcontrollers 3. Automata & Compiler Design 4.Design Patterns 5.12 Week MOOC Swayam	3	0	0	3
5	PE-III	1. Software Project Management 2. Mobile Adhoc Networks 3. Cyber Security and digital forensics 4. Security Assessment and Risk Analysis 5. 12 Week MOOC Swayam	3	0	0	3
6	OE – II	Machine Learning	3	0	0	3
7	PC	NS Tools & Hacking Lab	0	0	3	1.5
8	PC	Blockchain Technology Lab	0	0	3	1.5
9	SEC	Soft skills OR IELTS	0	1	2	2
10	AC	Technical Paper Writing & IPR	2	0	0	23
		Total Credits				23
		Mandatory Community Service Project Internship of 08 weeks duration during summer vacation				

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IV B. TECH - I SEMESTER

S.No.	Category	Title	Credits
1	PC	Smart Contract Essentials	3
2	MC- II	Human Resource Management	2
3	PE-IV	1. Ad-hoc and Sensor Networks 2. Malware Analysis & Reverse Engineering 3. Crypto Currency Technologies 4. Design of IoT Architecture	3
4	PE-V	1. Cyber Laws and Security Policies 2. Intrusion Detection and Prevention System 3. Metaverse 4. Virtual Reality	3
5	OE-III		3
6	OE-IV		3
7	SEC	Ethical Hacking	2
8	AC	Constitution of India	0
9	Internship	Evaluation of Industry Internship	2
		Total	**21**

SN	Course Code	Subjects	L	T	P	Credits
1	PC	Smart Contract Essentials	3	0	0	3
2	MC- II	Human Resource Management	2	0	0	2
3	PE-IV	1. IoT Applications development on Cloud Platform 2. Malware Analysis & Reverse Engineering 3. Design of IoT Architecture 4. Crypto Currency Technologies 5. MOOCS	3	0	0	3
4	PE-V	1. Cyber Laws and Security Policies 2. Intrusion Detection and Prevention System 3. Metaverse 4.Virtual Reality 5. No Sql Databases	3	0	0	3
5	OE-III	Deep Learning	3	0	0	3
6	OE-IV	Sales Force (Job Oriented Course)/	3	0	0	3
7	SEC	Linux System Administration(RHCSA)	0	1	2	2
8	Audit Course	Constitution of India	2	0	0	0
9	Internship	Evaluation of Industry Internship	0	0	0	2
		Total Credits	**19**	**1**	**2**	**23**

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IV B. TECH - II SEMESTER

S.NO	CATEGORY	TITLE	L	T	P	Credits
1	Internship & Project work	Full Semester Internship & Project work	0	0	24	12

From AI & ML - For Minor in AI & ML:	L-T-P-C
1. Advanced Data Structures & Algorithm Analysis	3-0-3-4.5
2. Principles of Artificial Intelligence	3-0-3-3
3. Operating Systems	3-0-3-4.5
4. Computer Networks	3-0-0-3
5. Machine Learning	3-0-0-3
6. Deep Learning	3-0-0-3
7. Cloud computing	3-0-0-3

CSE (IoT, Cyber Security including Blockchain Technology) offers the following subjects for Minor Degree:

For Minor in CSE (IoT, Cyber Security including Blockchain Technology):	L-T-P-C
1. Operating Systems	3-0-0-3
2. Introduction to IOT	3-0-0-3
3. Blockchain technology	3-0-0-3
4. Cloud computing	3-0-0-3
5. Ethical Hacking and Penetration Testing	3-0-0-3
6. IOT Lab Using Python	0-0-3-1.5
7. Blockchain technology Lab	0-0-3-1.5

Open Electives, offered to other department students:
Open Elective I   : Java Programming
Open Elective II   : Operating Systems
Open Elective III   : Data Base Management Systems
Open Elective IV   : Computer Networks

COURSES OFFERED FOR HONOURS DEGREE IN CSE(CIC)

S.No.	Course Name	Contact Hours per week			Credits
		L	T	P	
1	Vulnerability Analysis and Penetration Testing	3	0		3
2	Cloud Computing Security	3	0		3
3	Machine Learning for Cyber security	3	0		3
4	IOT security	3	0		3
5	Cyber Physical Systems and Security	3	0		3
6	IOT security Lab		3		1.5
7	Cyber Physical Systems and Security Lab		3		1.5
	Total				18

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II Year I Semester	DISCRETE MATHEMATICS & GRAPH THEORY	L	T	P	C
		3	0	0	3

Course Outcomes:

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

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

UNIT I

Mathematical Logic: Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.

UNIT II

Set theory: The Principle of Inclusion- Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.

UNIT III

Elementary Combinatorics: Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.

UNITIV

Recurrence Relations: Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous, Recurrence Relations.

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UNIT IV

Graphs: Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs.

Textbooks:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.
2. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.

ReferenceBooks:

1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.
2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science.

Online Learning Resources:

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

II Year I Semester	UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY	L	T	P	C
		2	1	0	3

Course Objectives:

The main objectives of the course is to

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Course Outcomes:

1. Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2)
2. Identify one's self, and one's surroundings (family, society nature) (L1, L2)
3. Apply what they have learnt to their own self in different day-to-day settings in real life (L3)
4. Relate human values with human relationship and human society. (L4)
5. Justify the need for universal human values and harmonious existence (L5)
6. Develop as socially and ecologically responsible engineers (L3, L6)

Course Topics

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT I

Introduction to Value Education (6 lectures and 3 tutorials for practice session)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself

Lecture 3: self-exploration as the Process for Value Education

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Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfill the Basic Human Aspirations

Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT II

Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture 7: Understanding Human being as the Co-existence of the self and the body.

Lecture 8: Distinguishing between the Needs of the self and the body

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.

Lecture 9: The body as an Instrument of the self

Lecture 10: Understanding Harmony in the self

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self

Lecture 11: Harmony of the self with the body

Lecture 12: Programme to ensure self-regulation and Health

Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III

Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction

Lecture 14: 'Trust' – the Foundational Value in Relationship

Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust

Lecture 15: 'Respect' – as the Right Evaluation

Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect

Lecture 16: Other Feelings, Justice in Human-to-Human Relationship

Lecture 17: Understanding Harmony in the Society

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Lecture 18: Vision for the Universal Human Order

Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT IV

Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)

Lecture 19: Understanding Harmony in the Nature

Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature

Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature

Lecture 21: Realizing Existence as Co-existence at All Levels

Lecture 22: The Holistic Perception of Harmony in Existence

Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT V

Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)

Lecture 23: Natural Acceptance of Human Values

Lecture 24: Definitiveness of (Ethical) Human Conduct

Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct

Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture 26: Competence in Professional Ethics

Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education

Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies

Lecture 28: Strategies for Transition towards Value-based Life and Profession

Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education

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PS1 Sharing about Oneself

PS2 Exploring Human Consciousness

PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being

PS4 Exploring the difference of Needs of self and body

PS5 Exploring Sources of Imagination in the self

PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society

PS7 Exploring the Feeling of Trust

PS8 Exploring the Feeling of Respect

PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)

PS10 Exploring the Four Orders of Nature

PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics

PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education

PS14 Exploring Steps of Transition towards Universal Human Order

READINGS:

Textbook and Teachers Manual

a. The Textbook

R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

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b. The Teacher's Manual

R R Gaur, R Asthana, G P Bagaria,Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

5. Small is Beautiful - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews

7. Economy of Permanence - J C Kumarappa

8. Bharat Mein Angreji Raj – PanditSunderlal

9. Rediscovering India - by Dharampal

10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

11. India Wins Freedom - Maulana Abdul Kalam Azad

12. Vivekananda - Romain Rolland (English)

13. Gandhi - Romain Rolland (English)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their

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analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

Online Resources:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%202023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

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II Year – I Semester	Digital Logic & Computer Organization	L	T	P	C
		3	0	0	3

Course Objectives:

The main objectives of the course is to

- provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals
- Describe memory hierarchy concepts
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices

UNIT – I

Data Representation: Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes

Digital Logic Circuits-I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

UNIT – II

Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters

Basic Structure of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von- Neumann Architecture

UNIT – III

Computer Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations

Processor Organization: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control

UNIT – IV

The Memory Organization: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

UNIT – V

Input/Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces

Textbooks:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 6th edition, McGraw Hill
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education.
3. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson.

Reference Books:

1. Computer Systems Architecture, M.Moris Mano, 3rdEdition, Pearson
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier
3. Fundamentals of Logic Design, Roth, 5thEdition, Thomson

Online Learning Resources:

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

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II Year – I Semester	**Advanced Data Structures & Algorithm Analysis**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objectives:

The main objectives of the course is to
- provide knowledge on advance data structures frequently used in Computer Science domain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

UNIT – I
Introduction:
Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.

AVL Trees:
Creation, Insertion, Deletion operations and Applications

B-Trees: Creation, Insertion, Deletion operations and Applications

UNIT – II

Heap Trees (Priority Queues): Min and Max Heaps, Operations and Applications
Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Bi-connected Components, applications
Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

UNIT – III

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths
Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths– General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

UNIT – IV

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem
Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

UNIT – V

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem
NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)
NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

Textbooks:
1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, 2nd Edition Universities Press
2. Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition University Press

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Reference Books:

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

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

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II Year – I Semester	Object Oriented Programming through Java	L	T	P	C
		3	0	0	3

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

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

Course Outcomes:

CO1: Explore the fundamentals Java concepts
CO2: List Object oriented concepts through Java
CO3: Implement Inheritance and Java libraries
CO4: Demonstrate Java Exceptions, threads and I/O Streams
CO5: Explore Java 8 features and Java FX library

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

UNIT II
Classes and Objects:
Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Passing Arguments by Value and by Reference, Keyword this.
Methods:
 Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Static keyword.
Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

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

UNIT III   12 hrs

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance, Final Class, Methods and attributes.
Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

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

UNIT IV   12 hrs

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

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java, Serialization (Text Book 2)

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

UNIT V

Java 8 features: Lambda Expressions, functional Interfaces, Default Methods, Date and Time API.
Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

Text Books:

1) The complete Reference Java, 11th edition, Herbert Schildt, TMH
2) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
3) Joy with JAVA, Fundamentals of Object-Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
4) JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:
1) JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.
2) Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

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Online Resources:
1) https://nptel.ac.in/courses/106/105/106105191/
2)https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046454761
8816347_shared/overview

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II Year – I Semester	Advanced Data Structures & Algorithm Analysis Lab	L	T	P	C
		3	0	0	3

Course Objectives:
The objectives of the course is to

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

Experiments covering the Topics:
- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees
- Shortest path algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

Basic Level Programs:
Min max problem (with and without recursion)
Binary Search (with and without recursion)
Balanced parenthesis

Sample Programs:

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.

2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.

3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.

4. Implement BFT and DFT for given graph, when graph is represented by
a) Adjacency Matrix
b) Adjacency Lists

5. Write a program for finding the biconnected components in a given graph.

6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).

7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.

8. Implement Job Sequencing with deadlines using Greedy strategy.

9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.

10. Implement N-Queens Problem Using Backtracking.
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11. Use Backtracking strategy to solve 0/1 Knapsack problem.

12. Implement Travelling Sales Person problem using Branch and Bound approach.

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II Year – I Semester	Object Oriented Programming through Java Lab	L	T	P	C
		3	0	0	3

Course Objectives:
The aim of this course is to

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

Experiments covering the Topics:
- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, JavaFX GUI

Sample Experiments:

Exercise – 1

Write a JAVA program to display default value of all primitive data type of JAVA
Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise – 2

Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
Write a JAVA program to sort for an element in a given list of elements using bubble sort
Write a JAVA program using StringBuffer to delete, remove character.

Exercise – 3

Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
Write a JAVA program implements method overloading.
Write a JAVA program to implement constructor.
Write a JAVA program to implement constructor overloading.

Exercise – 4

Write a JAVA program to implement Single Inheritance
Write a JAVA program to implement multi-level Inheritance
Write a JAVA program for abstract class to find areas of different shapes

Exercise – 5

Write a JAVA program give example for "super" keyword.
Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
Write a JAVA program that implements Runtime polymorphism

Exercise – 6

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Write a JAVA program that describes exception handling mechanism
Write a JAVA program Illustrating Multiple catch clauses
Write a JAVA program for creation of Java Built-in Exceptions
Write a JAVA program for creation of User Defined Exception

Exercise – 7

Write a JAVA program that creates threads by extending Thread class. First thread displays "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable)
Write a program illustrating is Alive and join ()
Write a Program illustrating Daemon Threads.
Write a JAVA program Producer Consumer Problem

Exercise – 8

Write a JAVA program that import and use the user defined packages
Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI
Integrate threading in Java components a window application.

Exercise – 9

Demonstrate Java 8 features with suitable examples.

II Year – I Semester	Python Programming (Skill Oriented Course)	L	T	P	C
			1	0	2

Course Objectives:
The main objectives of the course are to

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

UNTI-I

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.
Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.
Control Flow Statements: if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:
1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators
viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT-II

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.
Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.
Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:
7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list: i. addition ii.

Insertion iii. slicing
12. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III

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

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

UNIT-IV

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.
Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes vs Data Attributes, Encapsulation, Inheritance, Polymorphism.
Sample Experiments:
18. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V
Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas, Matplotlib

Sample Experiments:
24. Python program to check whether a JSON string contains complex object or not.
25. Python Program to demonstrate NumPy arrays creation using array () function.
26. Python program to demonstrate use of ndim, shape, size, dtype.

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27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
a) Apply head () function to the pandas data frame
b) Perform various data selection operations on Data Frame
30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

Reference Books:

1. Gowri shankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Online Learning Resources/Virtual Labs:

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

II Year I Semester	ENVIRONMENTAL SCIENCE	L	T	P	C
		2	0	0	0

Course Objectives:
- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

Course Outcomes:
- Grasp multidisciplinary nature of environmental studies and various renewable and non-renewabler resources.
- Understand flow and bio-geo-chemical cycles and ecologically ramids.
- Understand various causes of pollution and solid waste management and related preventive measures.
- About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
- Casus of population explosion, value education and welfare programmes.

UNIT–I
Multidisciplinary Nature Of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.
Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems–Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies–Food resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.– Energy resources.

UNIT–II
Ecosystems: Concept of an ecosystem. –Structure and function of an ecosystem– Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids– Introduction, types, characteristic features, structure and function of the following ecosystem:
  a. Forest ecosystem.
  b. Grassland ecosystem
  c. Desert ecosystem
  d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
Biodiversity And Its Conservation: Introduction 0 Definition: genetic, species and ecosystem diversity– Bio-geographical classification of India–Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habit at loss, poaching of wild life, man-wild life conflicts–Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

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UNIT–III

EnvironmentalPollution:Definition,Cause,effectsandcontrolmeasuresof:
  a. Air Pollution.
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes –Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earth quake, cyclone and land slides.

UNIT–IV

Social Issues and the Environment: From Unsustainable to Sustainable development–Urbanproblems related to energy – Water conservation, rain water harvesting, watershed management –Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions–Climate change, global warming, acidrain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Waste land reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. –Water(Prevention and control of Pollution) Act–Wild life Protection Act–Forest Conservation Act–Issues involved in enforcement of environmental legislation–Public awareness.

UNIT–V

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education –HIV/AIDS–Women and Child Welfare–Role of information Technology in Environment and human health–Case studies.
Field Work: Visit to a local area to document environmental assets River/forest grass land /hill /mountain – Visit to a local polluted site-Urban /Rural /Industrial /Agricultural Study of common plants, insects, and birds–river, hills lopes,etc..

Text books:
  1. Text book of Environmental Studies for Under graduate Courses Erach Bharucha for University Grants Commission, Universities Press.
  2. Palani swamy,"Environmental Studies", Pearson education
  3. S.Azeem Unnisa, "Environmental Studies" Academic Publishing Company
  4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Sci tech Publications (India), Pvt. Ltd.

Reference Books:
  1. Deeksha Dave and E.Sai Baba Reddy, "Text book of Environmental

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Science", Cengage Publications.
2. M.Anji Reddy,"Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J.Glynn Henry and Gary W.Heinke, "Environmental Sciences and Engineering", Prentice Hall of India Private limited
5. G.R.Chatwal,"AText Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M.Masters and Wendell P.Ela, "Introduction to Environmental Engineering and Science, Prentice Hall of India Private limited.

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		L	T	P	C
II Year **II Semester**	**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**	**2**	**0**	**0**	**2**

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

Course Outcomes:
- Define the concepts related to Managerial Economics, financial accounting and management.
- Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets
- Apply the Concept of Production cost and revenues for effective Business decision
- Analyze how to invest their capital and maximize returns
- Evaluate the capital budgeting techniques
- Develop the accounting statements and evaluate the financial performance of business entity.

UNIT-I
Managerial Economics:
Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting-Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

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

UNIT-III
Business Organizations and Markets:
Introduction – Nature, meaning, significance functions and advantages. Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly-Monopolistic Competition– Oligopoly-Price- Output Determination-Pricing Methods and Strategies

UNIT-IV
Capital Budgeting:
Introduction – Nature, meaning, significance, functions and advantages. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting–Features, Proposals, Methods and Evaluation. Projects– Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

UNIT-V
Financial Accounting and Analysis
Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions- Double- Entry Book Keeping, Journal, Ledger, Trial Balance-Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis-Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:
1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Managerial Economics: Principles And World wide Applications, 9E(Adaption) by Dominick Salvatore and siddhartha Rastogi.
3. Managerial Economics: Principles and Worldwide Applications by Dominick Salvatore.

II Year II Semester	Operating System	L	T	P	C
		3	0	0	3

Course Objectives:

The main objectives of the course is to make student

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

UNIT - I

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems
System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging

UNIT - II

Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication.
Threads and Concurrency: Multithreading models, Thread libraries, Threading issues.
CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

UNIT – III

Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization.
Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

UNIT - IV

Memory-Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping.
Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing
Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

UNIT - V

File System: File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system

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Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing.

Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.

Text Books:

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

Reference Books:

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

Online Learning Resources:

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

II Year II Semester	Database Management System	L	T	P	C
		3	0	0	3

Course Objectives: The main objectives of the course is to

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

UNIT I

Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.
Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

UNIT II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus.
BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

UNIT III

SQL:
 Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

UNIT IV

Schema Refinement (Normalization):
Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

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UNIT V

Transaction Concept:
Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.
Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based Indexing

Text Books:

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

Reference Books:

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

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

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II Year II Semester	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

Course Objectives: The main objectives of the course is to

- To understand the different types of networks
- To discuss the software and hardware components of a network
- To develop an understanding the principles of computer networks.
- To familiarize with OSI model and the functions of layered structure.
- To explain networking protocols, algorithms and design perspectives

UNIT I

Introduction: The Computer Network, Types of Networks, Network Topologies.
Network Models: Layered tasks, layers in the OSI model, TCP/IP protocol suite.
The Physical Layer: Types of Media, Data Rates and Encoding (Manchester)
Switching in Networks: Circuit, Packet Circuits

UNIT II
The Data Link Layer: Role and Functions

LLC Sub-layer: Functions, Framing, Error Control and Flow Control (For both Noisy and Noiseless Channels). PPP and HDLC

Error Detection and Correction: Block Coding, Linear Block Codes, Cyclic Codes, Checksum
MAC Access Control: Categories, Random Access, Controlled Access and Channelization. Wired LAN, IEEE802.3 and IEEE 802.11

UNIT III
Network Layer: Functions, Internetworking, Layer 3 Switching networks
Internet Protocols: Comprehensive View of IPV4 and IPV6
Internet Addresses: Classful Addresses, Disadvantages, and Classless (CIDR) addressing, Understanding IPV6 addresses
Subnetting: Need for sub-netting, Types, How FLSM works with examples
Network Layer supporting protocols: ARP and ICMP
Routing: What is Routing, Categorization, Distance Vector and RIPV2, Link State Routing and OSPF.

UNIT IV
The Transport Layer: Functions Meaning of Process-to-Process Delivery, Ports and Port Numbers, Sockets

User Datagram Protocol (UDP): Features, UDP segment Structure, Applications
Transmission Control Protocol (TCP): Features of TCP, TCP Segmant, TCP connection basics, TCP applications, TCP vs UDP, TCP Flow Control and Congestion Control

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UNIT V

Application Layer: Client server vs peer to peer network applications, examples of Various applications
Electronic Mail: Architecture and Services, SMTP, POP and IMAP
FTP: Basics, Working and Modes of operation
DNS: Role of DNS in internet Communication, DNS servers and their role, DNS records
Evolution of Internet: How internet is grown, WWW, HTTP, HTTPS

Text Books:
1. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw Hill Publication, 2017
2. Andrew Tanenbaum, Feamster Wetherall, Computer Networks, 6th Edition, Global Edition.

Reference Books:
1. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.
2. Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.

Web-Resources:

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

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

https://nptel.ac.in/courses/106105183/3

II Year II Semester	Database Management Systems Lab	L	T	P	C
		3	0	0	3

Course Objectives:

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

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

Sample Experiments:

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.

2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.

3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.

4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)

5. Implement the following:
Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.

7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.

9. Program development using creation of stored functions, invoke functions in

SQL Statements and write complex functions.

10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.

11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

13. Write a Java program that connects to a database using JDBC

14. Write a Java program to connect to a database using JDBC and insert values into it

15. Write a Java program to connect to a database using JDBC and delete values from it

Text Books/Suggested Reading:

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

I YEAR II SEMESTER	COMPUTER NETWORKS AND OPERATING SYSTEMS LAB	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To understand the different types of networks
- To discuss the software and hardware components of a network
- To enlighten the working of networking commands supported by operating system
- To familiarize the use of networking functionality supported by JAVA
- To familiarize with computer networking tools.

Course Outcomes:

After completion of the course, students will be able to

1. Analyze the data traffic using network tools (L4)
2. Understand network commands (L2)
3. Trace different CPU Scheduling algorithms (L2).
4. Implement Bankers Algorithms to Avoid Dead Locks (L3).
5. Evaluate CPU scheduling and Page replacement algorithms (L5).

List of Activities/Experiments (Computer Networks):

1. Study different types of Network cables (Copper and Fiber) and prepare cables (Straight and Cross) to connect Two or more systems. Use crimping tool to connect jacks. Use LAN tester to connect the cables.
     - Install and configure Network Devices: HUB, Switch and Routers. Consider both manageable and non-manageable switches. Do the logical configuration of the system. Set the bandwidth of different ports.
     - Install and Configure Wired and Wireless NIC and transfer files between systems in Wired LAN and Wireless LAN. Consider both adhoc and infrastructure mode of operation.

2. Work with the commands Ping, Tracert, Ipconfig, pathping, telnet, ftp, getmac, ARP, Hostname, Nbtstat, netdiag, and Nslookup

3. Use Packet tracer software to build network topology and configure using Distance vector routing protocol.

4. Use Packet tracer software to build network topology and configure using Link State routing protocol.

5. Using JAVA RMI Write a program to implement Basic Calculator.

6. Implement a Chatting application using JAVA TCP and UDP socket

7. Hello command is used to know whether the machine at the other end is working or not. Echo command is used to measure the round-trip time to the neighbor. Implement Hello and Echo commands using JAVA.

8. Using Wireshark perform the following operations:
   - Inspect HTTP Traffic

   - Inspect HTTP Traffic from a Given IP Address,

   - Inspect HTTP Traffic to a Given IP Address,

   - Reject Packets to Given IP Address,

   - Monitor Apache and MySQL Network Traffic.

Experiments covering the Topics:

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

Sample Experiments:

1. Practicing of Basic UNIX Commands.

2. Write programs using the following UNIX operating system calls

   fork, exec, getpid, exit, wait, close, stat, opendir and readdir

3. Simulate the following CPU scheduling algorithms

   a) FCFS b) SJF c) Priority d) Round Robin

4. Write a program to solve producer-consumer problem using Semaphores.

5. Implement the following memory allocation methods for fixed partition

   a) First fit b) Worst fit c) Best fit

6. Simulate the following page replacement algorithms

   a) FIFO b) LRU c) LFU

7. Simulate Paging Technique of memory management.

8. Implement Bankers Algorithm for Dead Lock avoidance

Text Books:

1. Shivendra S. Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, "TCP/IP Essentials:A Lab-Based Approach", Cambridge University Press, 2004.
2. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.

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Reference Books

1. Cisco Networking Academy, "CCNA1 and CCNA2 Companion Guide", Cisco Networking Academy Program, 3rd edition, 2003.
2. Elloitte Rusty Harold, "Java Network Programming", 3rd edition, O'REILLY, 2011.
3. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson, 2016

Online Learning Resources:
1. https://www.netacad.com/courses/packet-tracer - Cisco Packet Tracer.
2. Ns Manual, Available at: https://www.isi.edu/nsnam/ns/ns-documentation.html, 2011.
3. https://www.wireshark.org/docs/wsug_html_chunked/ -Wireshark.
4. https://nptel.ac.in/courses/106105183/25
5. http://www.nptelvideos.in/2012/11/computer-networks.html
6. https://nptel.ac.in/courses/106105183/3
7. http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php
8. https://www.cse.iitb.ac.in/~mythili/os/
9. http://peterindia.net/OperatingSystems.html

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II Year II	**Full Stack Development – 1**	L	T	P	C
Semester	**(Skill Enhancement Course)**	**3**	**0**	**0**	**3**

Course Objectives: The main objectives of the course are to
- Make use of HTML elements and their attributes for designing static web pages
- Build a web page by applying appropriate CSS styles to HTML elements
- Experiment with JavaScript to develop dynamic web pages and validate forms

Experiments covering the Topics:
- Lists, Links and Images
- HTML Tables, Forms and Frames
- HTML 5 and Cascading Style Sheets, Types of CSS
- Selector forms
- CSS with Color, Background, Font, Text and CSS Box Model
- Applying JavaScript - internal and external, I/O, Type Conversion
- JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
- JavaScript Functions and Events
- Node.js

Sample Experiments:
1. Lists, Links and Images
a. Write a HTML program, to explain the working of lists.

Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.

b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target Attributes.

c. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.

d. Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique

2. HTML Tables, Forms and Frames
a. Write a HTML program, to explain the working of tables. (use tags: <table>, <tr>, <th>, <td> and attributes: border, rowspan, colspan)

b. Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).
c. Write a HTML program, to explain the working of forms by designing Registration form. (Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).

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

3. HTML 5 and Cascading Style Sheets, Types of CSS

a. Write a HTML program, that makes use of <article>, <aside>, <figure>, <figcaption>, <footer>, <header>, <main>, <nav>, <section>, <div>, <span> tags.

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

c. Write a program to apply different types (or levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (identify selector, property and value).

4. Selector forms

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

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

a. Write a program to demonstrate the various ways you can reference a color in CSS.
b. Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
c. Write a program using the following terms related to CSS font and text:

i. font-size ii. Font-weight iii. font-style iv. Text-decoration v. text-transformation vi. Text-alignment
d. Write a program, to explain the importance of CSS Box model using
i. Content ii. Border iii. Margin iv. Padding

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

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

7. JavaScript Pre-defined and User-defined Objects

a. Write a program using document object properties and methods.
b. Write a program using window object properties and methods.
c. Write a program using array object properties and methods.

d. Write a program using math object properties and methods.
e. Write a program using string object properties and methods.
f. Write a program using regex object properties and methods.

g. Write a program using date object properties and methods.
h. Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

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

9. JavaScript Functions and Events
a. Design a appropriate function should be called to display
      i. Factorial of that number
      ii. Fibonacci series up to that number
      iii. Prime numbers up to that number
      iv. Is it palindrome or not
b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
      i. Factorial of that number
      ii. Fibonacci series up to that number
      iii. Prime numbers up to that number
      iv. Is it palindrome or not
c. Write a program to validate the following fields in a registration page
      i. Name (start with alphabet and followed by alphanumeric and the length
      should not be less than 6 characters)
      ii. Mobile (only numbers and length 10 digits)
      iii. E-mail (should contain format like xxxxxxx@xxxxxx.xxx)
  10. Demonstrate Higher order functions using Java script codes.

Text Books:
1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2. Web Programming with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, 2019 (Chapters 1-11).
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.

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

II Year – II Sem	DESIGN THINKING & INNOVATION	L	T	P	C
	(Audit Course)	2	0	0	0

Course Prerequisite:

Being able to identify a problem and an interest to solve it. Nature to consider different opinions and a challenging spirit to experiment several times with prototypes. Readiness to accept change and be Adaptable.

Course Description:

This course deals with various thinking patterns, enhancement of soft skills & personality development; It contains a step-by-step process to solve any real-world problem using Design Thinking. Each chapter gives an experimental and detailed view of an element in Design Thinking.

Course Objectives:
● To get exposed to the basic concepts Design Thinking of Stanford Model
● To understand the basic concepts of Empathy and the process of sensitization.
● To introduce the basic concepts of ideation techniques (flaring & focusing)
● To familiarize the basic concepts of prototyping and testing.
● Bringing innovation into engineering outcomes and enhancing the mindset & skillset of the students
● To acquire and apply the required mindsets apart from having the skill sets to solve real world challenges.

Course Outcomes: At the end of the course, the students will be able to
 ● Develop key skills like Critical thinking, Problem-solving, Collaboration, and Creativity.
 ● View problems as Opportunities.
 ● Empathize, sensitize and identify the problems.
 ● Understand the perspective of someone other than him/her.
 ● Encourage wild ideas. Defer judgement. Build on ideas of others.
 ● Translate an innovative idea to a prototype.
 ● Apply Design Thinking Principles to develop human centric solutions (products, strategies, methodologies, services).

UNIT I: **INTRODUCTION TO DESIGN THINKING**
Inspiration; Why Inspiration matters; Activity (Inspiration Walk); Thinking Patterns; Mindsets – dmindsets, emindsets, Fixed vs Growth Mindsets; Moonshot Thinking; Design Thinking; Innovation & Creativity; Teamwork; Case Studies on Teamwork; Problems in a Design Perspective;

UNIT II: EMPATHY & DEFINE
Introduction to empathy - What is Empathy; Why Empathy; Empathy Vs Sympathy; Empathizing Methods; Empathizing tools – Interviewing, Role Playing, Empathy Maps, Field Research, Diary Studies and Observation/Ethnography Tools; Empathy

Case Studies (Walt Disney, Baby Products, and UX Design); Intro to define - Why Define stage; How to define; The "How Might We" significance.

UNIT III: IDEATION TECHNIQUES

Introduction to Ideation; Welcome to Solution Space; Brainstorming & its Rules; Synthesizing and integrating the ideas. Mind-mapping the experiences; Flaring & Focus; (Introduction to "Yes but" – "Yes and"); Idea clustering; Flaring with and without constraints; Analogy Thinking; Opposite Thinking; Mash-up Method.

UNIT IV: PROTOTYPING & TESTING

Introduction to Prototyping - What is Prototyping; Need for a prototype; The concept of Prototyping; The Right IT; Prototyping Methods – Pitching, Story Telling (Canvas), Sketching, Paper Prototyping, 3D Printing, Video Making, Crafting, etc; Empathy-Oriented-Prototyping; Solution-Oriented-Prototyping; Prototyping Dashboards; Intro to Testing; Testing – User review, reflecting back on the observations, several testing techniques; Navigating through the Design Thinking Process.

UNIT V: APPLY DESIGN THINKING

Product Design & Innovation; Strategy Design; Business Model Development; Innovation Through Design; Service Innovations; Case Studies; Take up a Design Project;

Text Book:
1. **"Design Thinking:** Understanding How Designers Think & Work**"-**by Nigel Cross
2. **"Introduction to Life Skills Education"-** NCERT Training Package
3. **"Change by Design" –** Tim Brown

Reference Books:
1. A Field Guide to Human Centric Design – IDEO.org
2. Make Space – Scott Doorley and Scott Witthoft
3. Lean Startup – Eric Ries
4. Creative Confidence: Unleashing the Creative Potential Within Us All, David Kelley (d.school Founder) and Tom Kelley
5. The Achievement Habit – Bernie Roth (d.school Founder)
6. The art of innovation – Tom Kelley
7. The Ten Faces of Innovation – Tom Kelley