w.e.f. 2023-24

D23

B. Tech.

COMPUTER SCIENCE AND ENGINEERING

(B.Tech II Year Ist and IInd Semester Syllabus)

Department of Computer Science and Engineering

(B.Tech. CSE Programme Accredited by NBA)

DHANEKULA INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Approved by AICTE, Accredited by NBA, Affiliated to JNTUK, Kakinada)

Ganguru, Vijayawada

Andhra Pradesh - 521139,

INDIA.

www.diet.ac.in

Dhanekula Institute of Engineering & Technology

AUTONOMOUS

Approved by AICTE New Delhi, Permanently Affiliated to JNTU Kakinada

An ISO 9001-2015 Certified Institution & NBA Accredited (EEE, ME, ECE& CSE)

Ganguru, Vijayawada–521139

Department of Computer Science & Engineering

B. Tech.–II Year I Semester

S.No.	Category	Title	L	T	P	Credits
1	BS&H	Discrete Mathematics & Graph Theory	3	0	0	3
2	BS&H	Universal HumanValues–2 Understanding Harmony and Ethical Human Conduct	2	1	0	3
3	Engineering Science	Digital Logic & Computer Organization	3	0	0	3
4	Professional Core	Advanced Data Structures & Algorithm Analysis	3	0	0	3
5	Professional Core	Object Oriented Programming Through Java	3	0	0	3
6	Professional Core	Advanced Data Structures and Algorithm Analysis Lab	0	0	3	1.5
7	Professional Core	Object Oriented Programming Through Java Lab	0	0	3	1.5
8	Skill Enhancement course	Python Programming	0	1	2	2
9	Audit Course	Environmental Science	2	0	0	-
Total			**16**	**2**	**8**	**20**

B.Tech.–II Year II Semester

S.No.	Category	Title	L	T	P	Credits
1	Management Course-I	Managerial Economics and Financial Analysis	2	0	0	2
2	Engineering Science/ Basic Science	Probability & Statistics	3	0	0	3
3	Professional Core	Operating Systems	3	0	0	3
4	Professional Core	Database Management Systems	3	0	0	3
5	Professional Core	Software Engineering	3	0	0	3
6	Professional Core	Operating Systems Lab	0	0	3	1.5
7	Professional Core	Database Management Systems Lab	0	0	3	1.5
8	Skill Enhancement Course	FullStack Development–I	0	1	2	2
9	BS&H	Design Thinking & Innovation**(or)** https://onlinecourses.swayam2.ac.in/aic23_ge17/preview(or) MOOCS/NPTEL/SWAYAM on Design Thinking &Innovation	1	0	2	2
Total			**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

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Department of Computer Science & Engineering

Annexure-I

B. Tech.–II Year I Semester

S. No.	Category	Title	L	T	P	Credits
1	BS&H	Discrete Mathematics & Graph Theory	3	0	0	3
2	BS&H	Universal human values –2 Understanding harmony and Ethical human conduct	2	1	0	3
3	Engineering Science	Artificial Intelligence	3	0	0	3
4	Professional Core	Advanced Data Structures & Algorithm Analysis	3	0	0	3
5	Professional Core	Object Oriented Programming Through Java	3	0	0	3
6	Professional Core	Advanced Data Structures & Algorithm Analysis Lab	0	0	3	1.5
7	Professional Core	Object Oriented Programming Through Java Lab	0	0	3	1.5
8	Skill Enhancement course	Python Programming	0	1	2	2
9	Audit Course	Environmental Science	2	0	0	-
Total			**16**	**2**	**8**	**20**

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Ganguru, Vijayawada-521 139

DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY
Department of Computer Science & Engineering
POs/PSOs

List Program Outcomes

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

List Program Specific Outcomes

PSO1: Have expertise in algorithms, networking, web applications and software engineering for efficient design of computer-based systems of varying complexity.
PSO2: Qualify in national international level competitive examinations for successful higher studies and employment.

DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY
Department of Computer Science &Engineering

VISION–MISSION-PEOs

Institute Vision	Pioneering Professional Education through Quality
Institute Mission	Providing Quality Education through state-of-art infrastructure, laboratories and committed staff. Molding Students as proficient, competent, and socially responsible engineering personnel with ingenious intellect. Involving faculty members and students in research and development works for betterment of society.
Department Vision	To empower students of Computer Science and Engineering Department to be technologically adept, innovative, global citizens possessing human values.
Department Mission	Encourage students to become self-motivated and problem-solving individuals. Prepare students for professional career with academic excellence and leadership skills. Empower the rural youth with computer education. Create Centre's of excellence in Computer Science and Engineering.
Program Educational Objectives (PEOs)	Graduates of B.Tech (Computer Science & Engineering) will be able to **PEO1:**Excel in Professional career by demonstrating the capabilities of solving real time problems through Computer-based system, Machine learning and allied software applications. **PEO2:** Able to pursue higher education and research. **PEO3:**Communicate effectively, recognize, and incorporate appropriate tools and technologies in the chosen profession. **PEO4:**Adapt to technological advancements by continuous learning, team collaboration and decision making.

II-I Semester

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Regulation
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DISCRETE MATHEMATICS AND GRAPH THEORY

Course Category:	BS&H	Credits: 3	
Course Type:	Theory	Lecture-Tutorial-Practice:	3 0 0
Prerequisites	Basics of Linear Algebra, Algorithms..	Continuous Evaluation	30M
		Semester End Evaluation	70M
		Total Marks	100M

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Build skills in solving problems on mathematical logic.	Applying
CO2	Solve problems using sets, functions and relations.	Applying
CO3	Develop strategies for solving problems on combinatorial methods as well as recurrence relations.	Applying
CO4	Apply fundamental concepts of Graph Theory to practical purposes.	Applying
CO5	Examine the efficiency of algorithms of graphs in different scenarios.	Analyzing

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (1- Low, 2 – Moderate,3 – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3	3	3

COURSE CONTENT:

UNIT-I: Mathematical Logic

Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

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UNIT-II: Set Theory

Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties.

UNIT-III: Combinatorics and Recurrence Relations

Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems.

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Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic, Roots, Solving Inhomogeneous Recurrence Relations

UNIT-IV: Graph Theory

Basic Concepts, Graph Theory and its Applications, Subgraphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Topological sorting.

UNIT-V: Multi Graphs

Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

Text Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill, 2002
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill, 2011
3. Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill, 2007

Reference Books:

1. Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011.
2. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill, 2012.
3. Graph Theory with Applications to Engineering and Computer Science, NARSINGH DEO, DOVER PUBLICATIONS, INC.,2016.

E-Resources:

1. Discrete Mathematics - Course (nptel.ac.in)
2. Graph Theory - Course (nptel.ac.in)
3. Graph theory in Discrete Mathematics - javatpoint
4. Discrete Mathematics Tutorial - GeeksforGeeks
5. DISCRETE MATHEMATICS AND GRAPH THEORY - PURNA CHANDRA BISWAL - Google Books
6. mth202.pdf (iitk.ac.in)

22/7/24

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Regulation D23

UNIVERSIAL HUMAN VALUES -2 UNDERSTANDING HARMONY & ETHICAL HUMAN CONDUCT

Course Category:	(HSMC)	Credits: 3	
Course Type:	Theory	Lecture-Tutorial-Practice:	2 1 0
Prerequisites	-	Continuous Evaluation	30M
		Semester End Evaluation	70M
		Total Marks	100M

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Aspire continuous happiness and prosperity	Understanding
CO2	Explore harmony in the human being, the co-existence of self and body.	Understanding
CO3	Develop competence and value human-human relationship.	Understanding
CO4	Perceive harmony at all levels of existence.	Understanding
CO5	Validate definitiveness of ethical human conduct	Understanding
CO6	Aspire continuous happiness and prosperity	Understanding

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (1- Low, 2 – Moderate,3 – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	3	3	3	3	-	-	-	-	-
CO2	-	-	-	-	-	3	3	3	3	-	-	-	-	-
CO3	-	-	-	-	-	3	3	3	3	-	-	-	-	-
CO4	-	-	-	-	-	3	3	3	3	-	-	-	-	-
CO5	-	-	-	-	-	3	3	3	3	-	-	-	-	-
CO6	-	-	-	-	-	3	3	3	3	-	-	-	-	-

COURSE CONTENT:

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

Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

22/5/24

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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
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
PS1 Sharing about Oneself

22/7/24
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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

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

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

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 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.

Head of the Department
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Readings: Text Book 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

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)

Online Resources:

1. https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/ UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHVII%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%20 July%2023.pdf
5. https://fdp-si.aicte-india.org/UHVII%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%20FDPSI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicteindia.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-humanvalues/Chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385

https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

Regulation
D23

DIGITAL LOGIC & COMPUTER ORGANISATION

Course Category:	**Engineering Science**	Credits: 3	
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3 0 0
Prerequisites	Basic knowledge of number systems and logic gates	Continuous Evaluation	30M
		Semester End Evaluation	70M
		Total Marks	100M

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Apply various number systems and minimization of logic functions and design of combinational circuits	Applying
CO2	Build design of sequential logic circuits	Applying
CO3	Apply the computer arithmetic operations and Processor organization	Applying
CO4	Apply the knowledge of various types of memory to enhance system performance	Applying
CO5	Apply the knowledge of various I/O interface techniques to design and implement efficient I/O operations	Applying

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	3	-	-	-	-	-	-	-	-	-	-	3	3

COURSE CONTENT:

UNIT-I:

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

Digital Logic Circuits-I: Boolean Algebra,Minimization of Logic expressions, K-Map Simplification, Combinational Circuits- Decoders, Multiplexers [8]

UNIT-II:

Digital Logic Circuits-II: Sequential Circuits, Flipflops, Binary counters, Registers, Shift Registers, Basic Structure of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von- Neumann Architecture. [9]

UNIT-III:
Computer Arithmetic: Addition and Subtraction of Signed Numbers, Multiplication of Positive Numbers, Signed-operand 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. [9]

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. [8]

UNIT-V:
Input/Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces, GPU– Introduction, Working. [8]

Text Books:
1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 6th Edition, McGraw Hill, 2023.
2. Digital Design, M. Morris Mano, 6thEdition, Pearson Education,2018.
3. Computer Organization and Architecture, 11th Edition, William Stallings, Pearson 2019.

Reference Books:
1. Computer Systems Architecture, M.Moris Mano, 3rdEdition, Pearson 2017
2. Computer Organization and Design, David A. Paterson, John L.Hennessy, Elsevier 2021.
3. Fundamentals of Logic Design, Roth, 5thEdition, Thomson 2006.

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

Regulation
D23

ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS

Course Category:	**Professional Core**	Credits: 3	
Course Type:	**Theory** / Tutorial /Practical	Lecture-Tutorial-Practice:	3 0 0
Prerequisites	Sound knowledge of basic data structures and implementations. Basics of Mathematics and Programming.	Continuous Evaluation	30M
		Semester End Evaluation	70M
		Total Marks	100M

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Illustrate AVLwith insights into Algorithm Analysis with Asymptotic Notations	Applying
CO2	Examine Heap Trees, Graphs and solve various applications using divide and conquer technique	Analyzing
CO3	Analyze different applications using Greedy Method and Dynamic Programming	Analyzing
CO4	Examine Backtracking, Branch and Bound to solve various problems	Analyzing
CO5	Compare NP Hard and NP Complete Problems using different problems	Analyzing

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	-	3	-	-	-	-	-	-	-	-	-	-	3	3
CO3	-	3	-	-	-	-	-	-	-	-	-	-	3	3
CO4	-	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	-	3	-	-	-	-	-	-	-	-	-	-	3	3

COURSE CONTENT:

UNIT-I:

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Review of Asymptotic Notations.(already studied in 1-2-Data Structures subject)

AVL Trees – Creation, Insertion, Deletion operations and Applications. [8]

UNIT-II:

Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications

Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications

Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, [9]

UNIT-III:

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem,Minimum cost spanning trees, Single Source Shortest Paths- General Weights (Bellman Ford Algorithm),Optimal Binary Search Trees

Dynamic Programming I: General Method, All pairs shortest paths. [8]

UNIT-IV:

Dynamic Programming II: 0/1Knapsack, String Editing, Travelling Salesperson problem

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem. [8]

UNIT-V:

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem (without proof) NP Hard Graph Problems: Clique Decision Problem (CDP), Traveling Salesperson Decision Problem (TSP)

NP Hard Scheduling Problems:Job Shop Scheduling. [9]

Text Books:

1. Fundamentals of Data Structures in C++, HorowitzEllis, SahniSartaj, MehtaDinesh, 2ndEdition, Universities Press, 2008.
2. Computer Algorithms in C++, Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2nd Edition, University Press, 2008.

Reference Books:

1. Data Structures and program design in C, Robert Kruse, 2nd Edition, Pearson Education Asia, 2006.
2. An introduction to Data.Structures with applications, Trembley& Sorenson,2nd Edition, McGrawHill, 2017.

E-Resources:

1. Introduction to the NPTEL MOOC on Design and Analysis of Algorithms by Prof. MUKUND MADHAVAN, IIT MADRAS,Design and Analysis of Algorithms https://archive.nptel.ac.in/courses/106/106/106106131/
2. https://www.tutorialspoint.com/advanced_data_structures/index.asp
3. http://peterindia.net/Algorithms.html
4. Abdul Bari,Introduction to Algorithms (youtube.com)

Regulation
D23

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Category:	**Professional Core**	Credits : 3	
Course Type:	**Theory** / Tutorial /Practical	Lecture-Tutorial-Practice:	3 0 0
Prerequisites	Basic Programming	Continuous Evaluation	30M
		Semester End Evaluation	70M
		Total Marks	100M

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Apply object oriented concepts, control structures in Java.	Applying
CO2	Applying Object oriented constructs such as various class hierarchies, Methods	Applying
CO3	Applying concepts like arrays, inheritances, interfaces in java	Applying
CO4	Applying packages and exception handling in java	Applying
CO5	Apply Multi-threading ,String methods and Java FX in java	Applying

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	3	3
CO2	3	-	-	-	-	-	-	-	-	-	-	3	3	3
CO3	3	-	-	-	-	-	-	-	-	-	-	3	3	3
CO4	3	-	-	-	-	-	-	-	-	-	-	3	3	3
CO5	3	-	-	-	3	-	-	-	-	-	-	3	3	3

COURSE CONTENT:

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, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement. [9]

UNIT-II:

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

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

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2) [8]

UNIT-III:

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, 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.

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

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations. [9]

UNIT-IV:

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.

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 Exception

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer, String Builder. [8]

UNIT-V:

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

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). [8]

Text Books:

1. JAVA One Step Ahead, Anitha Seth, B.L.Juneja, Oxford, 2017.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge,2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4thEdition, Pearson, 2017.

Reference Books:

1. The complete Reference Java, Herbert Schildt, 11th Edition,TMH, 2017.
2. Introduction to Java programming, 7thEdition, Y Daniel Liang, Pearson, 2012.

E-Resources/Digital Material:

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

Regulation D23

ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB

Course Category:	**Professional Core**	Credits:1.5	
Course Type:	Theory / Tutorial /**Practical**	Lecture-Tutorial-Practice:	0 0 3
Prerequisites	Knowledge of implementation of basic data structures with arrays and linked lists. Basics of Mathematics and Programming.	Continuous Evaluation	30M
		Semester End Evaluation	70M
		Total Marks	100M

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Implement data structures like AVL Trees, Heap Tree and Graphs	Applying
CO2	Solve problems using different algorithmic approaches like Divide and Conquer, Greedy method, Dynamic Programming and Backtracking	Applying

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	3	-	-	-	3	3
CO2	3	-	-	-	3	-	-	-	3	-	-	-	3	3

COURSE CONTENT:

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 Min and Max Heap using arrays, delete any element and display the content of the Heap.
3. Implement BFT and DFT for given graph, when graph is represented by
   a) Adjacency Matrix b) Adjacency Lists
4. Write a program for finding the biconnected components in a given graph.
5. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
6. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
7. Implement Job Sequencing with deadlines using Greedy strategy.
8. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
9. Implement N-Queens Problem Using Backtracking.
10. Use Backtracking strategy to solve 0/1 Knapsack problem.
11. Implement Travelling Salesperson problem using Branch and Bound approach.

Text Books:

1. Fundamentals of Data Structures in C++, HorowitzEllis, SahniSartaj, MehtaDinesh, 2nd Edition, Universities Press, 2008.
2. Computer Algorithms in C++, Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2nd Edition, University Press, 2008.

Reference Books:

1. Data Structures and program design in C, Robert Kruse, 2nd Edition, Pearson Education Asia, 2006.
2. An introduction to Data Structures with applications, Trembley& Sorenson, McGrawHill, 2nd Edition, 2017.

E-Resources/Digital Material:

1. Introduction to the NPTEL MOOC on Design and Analysis of Algorithms by Prof. MUKUND MADHAVAN, IIT MADRAS,Design and Analysis of Algorithms https://archive.nptel.ac.in/courses/106/106/106106131/
2. https://www.tutorialspoint.com/advanced_data_structures/index.asp
3. http://peterindia.net/Algorithms.html
4. Abdul Bari,Introduction to Algorithms (youtube.com)

Regulation D23

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Course Category:	PC	Credits : 3	
Course Type:	Practical	Lecture-Tutorial-Practice:	- - 3
Prerequisites	Good programming knowledge	Continuous Evaluation	30-M
		Semester End Evaluation	70-M
		Total Marks	100--M

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Apply the basic of concepts of programming in java.	Applying
CO2	Apply the basic of concepts of Operations, Expressions, Control-flow, and Strings.	Applying
CO3	Analyze different keywords in java	Analyzing
CO4	Analyze the concepts of inheritance in java.	Analyzing
CO5	Analyze applications using Exception Handling, Multi-threading, java FX Event Handling packages in java.	Analyzing

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1-	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	-	3	3	3
CO2	3	-	-	-	3	-	-	-	-	-	-	3	3	3
CO3	-	3	-	-	3	-	-	-	-	-	-	3	3	3
CO4	-	3	-	-	3	-	-	-	-	-	-	3	3	3
CO5	-	3	-	-	3	-	-	-	-	-	-	3	3	3

COURSE CONTENT:

Exercise - 1

a) Write a JAVA program to display default value of all primitive data type of JAVA.

b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2

a) Write a JAVA program to search for an element in a given list of elements using binary search Mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort.

c) Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3

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

b) Write a JAVA program implement method overloading.

c) Write a JAVA program to implement constructor.
d) Write a JAVA program to implement constructor overloading.

Exercise - 4

a) Write a JAVA program to implement Single Inheritance.
b) Write a JAVA program to implement multi level Inheritance.
c) Write a JAVA program for abstract class to find areas of different shapes

Exercise - 5

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

Exercise - 6

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

Exercise - 7

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

Exercise – 8

a) Write a JAVA program that import and use the user defined packages.
b) Without writing any code, build a GUI that display text in label and image in an Image View (use Java FX)
c) Build a Tip Calculator app using several Java FX components and learn how to respond to user Interactions with the GUI

TEXT BOOKS:

1. JAVA One Step Ahead, Anitha Seth, B.L.Juneja, Oxford, 2017.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge,2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson, 2014.

REFERENCE BOOKS:

1. The complete Reference Java, Herbert Schildt, 11th Edition, TMH, 2017.
2. Introduction to Java Programming, Y Daniel Liang, 7th Edition, Pearson, 2009.

E-RESOURCES/DIGITAL MATERIAL:

1. **https://nptel.ac.in/courses/106/105/106105191/**
2. **https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046454761881634 7_shared/overview**
3. **https://www.youtube.com/watch?v=3b-Wprhc_P8&list=PLsyeobzWxl7gcjd9Cx7W7ViDQk9TcfUlQ**

Regulation
D23

PYTHON PROGRAMMING

Course Category:	**Skill Enhancement Course**	Credits :2			
Course Type:	**Tutorial&Practical**	Lecture-Tutorial-Practice:	0	1	2
Prerequisites	Basic programming knowledge	Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Outcomes:

After Successful Completion of course ,the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	ApplyPython's fundamental components, constructcontrol flow statements, perform input/output operations, manage exceptions, and developwell-structured, efficient, and robust Python programs.	Applying
CO2	Apply functions and their arguments, manage variable scope and lifetime, handle command line arguments, manipulate strings and lists using various operations and methods, and utilize built-in functions and commonly used modules to develop efficient Python programs.	Applying
CO3	Apply built-in functions and methods on dictionaries, tuples, and sets, utilize tuples and sets for efficient data handling.	Applying
CO4	Utilize file methods and modules to perform file operations, define and apply object-oriented programming principles by developing classes and objects, and implement encapsulation, inheritance, and polymorphism to construct robust and maintainable Python programs.	Applying
CO5	Apply functional programming principles, work with JSON and XML data formats, utilize NumPy for numerical computations, and manipulate data efficiently using Pandas to perform data science tasks and analyses effectively.	Applying

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	-	3	3	3
CO2	3	-	-	-	3	-	-	-	-	-	-	3	3	3
CO3	3	-	-	-	3	-	-	-	-	-	-	3	3	3
CO4	3	-	-	-	3	-	-	-	-	-	-	3	3	3
CO5	3	-	-	-	3	-	-	-	-	-	-	3	3	3

COURSE CONTENT:

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

UNIT-II:

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

Sample Experiments:

1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Write a program to find the length of the string without using any library functions.
4. Write a program to check if the substring is present in a given string or not.
5. Write a program to perform the given operations on a list:
   i. additionii. Insertioniii. slicing

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 andSlicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists,Relation between Tuples and Dictionaries, Usingzip () Function, Sets, Set Methods,Frozen set.

Sample Experiments:

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

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, Pythonos and os.path Modules.
Object-Oriented Programming: Classes and Objects, Creating Classes in Python, CreatingObjects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes VsData Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

1. Write a program to sort words in a file and put them in another file. The output fileshould have only lower-case words, so any upper-case words from source must belowered.

2 Python program to print each line of a file in reverse order.
3 Python program to compute the number of characters, words and lines in a file.
4 Write a Python program to create a class that represents a shape. Include methods tocalculate 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, NumPywith Python, Pandas.

Sample Experiments:

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

Text Books:

1. Fundamentals of PYTHON , Lambert, Kenneth A and Martin Osborne.Cengage, 2023.
2. Python Programming: A Modern Approach, Kurama, Vamsi. Pearson Education India, 2018.

Reference Books:

1. Introduction to Python programming, Gowrishankar, S., and A. Veena. Chapman and Hall, CRC Press, 2018.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson,2024
3. Introduction to programming using Python, Liang, Y. Daniel. Pearson, 2017.

E-Resources/Digital Material:

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

Regulation
DIET23

ENVIRONMENTAL SCIENCE

Course Code

Course Category:	Audit Course	Credits:-			
Course Type:	Theory	Lecture-Tutorial-Practice:	2	0	0
Prerequisites	Science	Continuous Evaluation	30M		
		Semester End Evaluation	-		
		Total Marks	-		

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Understand multi disciplinary nature of environmental studies and various renewable and non-renewable resources	K-2
CO2	Understand flow and bio-geo-chemical cycles and ecological pyramids.	K-2
CO3	Understand various causes of pollution and solid waste management and related preventive measures.	K-2
CO4	Understand the concepts of rain water harvesting, watershed management, ozone layer depletion, and waste land reclamation.	K-2
CO5	Illustrate the causes of population explosion, value education, and welfare programs.	K-3

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO3	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO4	-	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	-	3	-	-	-	-	-	-	-	-	-	-	3	3

COURSE CONTENT:

22/7/24

22/7/24

UNIT–1

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, casestudies – Timber extraction – Mining, dams and other effects on forest and tribal people –Water resources – Use andover utilization of surface and groundwater – Floods, drought, conflicts over water, dams–

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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 overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.–Energy resources:

UNIT–2

Ecosystems: Concept to fan ecosystem. –Structure and function of an ecosystem–Producers, consumers, and decomposers– Energy flow in the ecosystem– Ecological succession – Foodchains, foodwebs, 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 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-spots of biodiversity –Threats to biodiversity: habitat loss, poaching of wild life, man-wild life conflicts–Endangered and endemic species of India –Conservation of bio diversity: In-situ and Ex-situ conservation of biodiversity.

UNIT–3

Environmental Pollution: Definition, Cause, effects and control measures of:

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, earthquake, cyclone and landslides.

UNIT–4

Social Issues and the Environment: From Unsustainable to Sustainable Development–Urban problems related to energy – Water conservation, rainwater harvesting, watershed management –Resettlement and rehabilitation of people; its problems and concerns. Case studies–Environmental ethics: Issues and possible solutions–Climate change, global warming, acid rain, 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– Wildlife Protection Act – Forest Conservation Act–Issues involved in enforcement of environmental legislation–Public awareness.

UNIT–5

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 grassland / hill/ mountain – Visit to a local polluted site - Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

Textbooks:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, "Environmental Studies", Pearson education
3. S.Azeem Unnisa, "Environmental Studies" Academic Publishing Company
4. K. Raghavan Nambiar, "Textbook of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

ReferenceBooks:

1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Textbook of Environmental Sciences and Technology", B S 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, "A Text Book of Environmental Studies" Himalaya Publishing House

Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice Hall of India Private limited.

Head of the Department
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Head 17/7/24
Department of Civil Engineering
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II-II SEMESTER

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Dhanekula Institute of Engineering & Technology

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Ganguru, Vijayawada – 521139

Department of Computer Science & Engineering

B. Tech.–II Year II Semester

S. No.	Category	Title	L	T	P	Credits
1	Management Course- I	Managerial Economics and Financial Analysis	2	0	0	2
2	Engineering Science/ Basic Science	Probability & Statistics	3	0	0	3
3	Professional Core	Operating Systems	3	0	0	3
4	Professional Core	Database Management Systems	3	0	0	3
5	Professional Core	Software Engineering	3	0	0	3
6	Professional Core	Operating Systems Lab	0	0	3	1.5
7	Professional Core	Database Management Systems Lab	0	0	3	1.5
8	Skill Enhancement Course	Full Stack Development–I	0	1	2	2
9	BS&H	Design Thinking & Innovation**(or)** https://onlinecourses.swayam2.ac.in/aic23_ge17/preview(or) MOOCS/NPTEL/SWAYAM on Design Thinking & Innovation	1	0	2	2
Total			**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 08weeks duration during summer vacation						

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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Category:	**Management Course- I**	Credits: 2	
Course Type:	**Theory**	Lecture-Tutorial-Practice:	2 0 0
Prerequisites	Basic microeconomics, fundamental financial and management accounting principles.	Continuous Evaluation	30M
		Semester End Evaluation	70M
		Total Marks	100M

Course Outcomes:

After Successful Completion of the course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Understanding the concept of managerial economics, Demand function, and different demand forecasting methods.	2
CO2	Discuss the concepts of production function, economies of scale, optimum size of the firm, and cost & break-even analysis.	2
CO3	Describe market structure and pricing under varied market conditions, Classify the types of business organizations and business cycles.	2
CO4	Evaluate the projects by applying tools and techniques of capital budgeting to accept or reject the new projects in business.	3
CO5	Prepare financial statements for analysis by using accounting tools	3

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO01	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	3	3	3	3	-	-	-
CO2	-	-	-	-	-	-	-	3	3	3	3	-	-	-
CO3	-	-	-	-	-	-	-	3	3	3	3	-	-	-
CO4	-	-	-	-	-	-	-	3	3	3	3	-	-	-
CO5	-	-	-	-	-	-	-	3	3	3	3	-	-	-

COURSE CONTENT:

UNIT-1:

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-2:

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 BreakEven Point (Simple Problems)-Managerial significance and limitations ofBreak-Even Analysis.

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UNIT-3:

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 MonopolyMonopolisticCompetition–Oligopoly-Price-Output Determination-Pricing Methods and Strategies

UNIT-4:

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 (simple problems)

UNIT-5:

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.

Reference Books:

1. Managerial Economics: Principles and Worldwide Applications, 9E (Adaptation) by Dominick Salvatore and Siddhartha Rastogi.
2. Managerial Economics: Principles and Worldwide Applications by Dominick Salvatore.

E-Resources:

1. https://nptel.ac.in/courses/110101005

Websites:

- https://www.geeksforgeeks.org/principles-and-types-of-managerial-economics/
- https://www.tutorialspoint.com/managerial_economics/index.htm

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PROBABILITY AND STATISTICS

Course Category:	**Engineering Science/ Basic Science**	Credits: 3	
Course Type:	Theory	Lecture-Tutorial-Practice:	3 0 0
Prerequisites	Basic mathematics and statistics.	Continuous Evaluation	30M
		Semester End Evaluation	70M
		Total Marks	100M

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	**Course Outcome Description**	K – Level
CO1	Classify the concepts of data science and employ descriptive statistical methods.	Applying
CO2	Interpret the association of characteristics and through correlation and regression tools	Analysing
CO3	Apply discrete and continuous probability distributions.	Applying
CO4	Apply Sampling techniques to get estimates of the population	Applying
CO5	Test the hypothesis based on small and large sample tests.	Analysing

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3	3	3

COURSE CONTENT:

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes: Upon successful completion of this course, the student should be able to

1. Classify the concepts of data science and its importance (L2)
2. Interpret the association of characteristics and through correlation and regression tools (L4)
3. Apply discrete and continuous probability distributions (L3)
4. Design the components of a classical hypothesis test (L6)
5. Infer the statistical inferential methods based on small and large sampling tests (L4)

Unit–I: Descriptive statistics and methods for data science:

Data science – Statistics Introduction –Population vs Sample –Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability – Skewness – Kurtosis.

UNIT–II: Correlation and Regression:
Correlation– Correlation coefficient–Rank correlation.
Linear Regression: Straight line – Multiple Linear Regression - Regression coefficients and properties – Curvilinear Regression: Parabola – Exponential – Power curves.

UNIT–III: Probability and Distributions:
Probability– Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables– Distribution functions–Probability mass function, Probability density function and Cumulative distribution functions– Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT–IV: Sampling Theory:
Introduction–Population and Samples –Sampling distribution of Means and Variance (definition only)–Central limit theorem (without proof)–Introduction to t, χ^2 and F-distributions- point and interval estimations –maximum error of estimate.

UNIT–V: Tests of Hypothesis:
Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Test of significance for large samples and Small Samples: Single and difference means – Single and two proportions – Student's t-test, F-test, χ^2-test.

Text Books:

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

Reference Books:

1. **Shron L. Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2. **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. **Sheldon M. Ross**, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4. **Johannes Ledolter and Robert V. Hogg**, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

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OPERATING SYSTEMS

Course Category:	**Professional Core**	Credits : 3	
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3 0 0
Prerequisites	Understanding of basics of Computer Organization	Continuous Evaluation	30M
		Semester End Evaluation	70M
		Total Marks	100M

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Define thefunctionalaspectsand implementationmethodsofdifferentmodulesinageneral-purpose operating system.	Understanding
CO2	Apply scheduling algorithms, multithreaded programmingand inter-process communicationthrough examples.	Applying
CO3	Identifydeadlockdetection, recovery,preventionand avoidance algorithm	Applying
CO4	Solve variousmemorymanagement strategiessuchaspagingandsegmentation, virtual memory, swappingandpagereplacement algorithms.	Applying
CO5	Listvarioussecuritymeasuresand systemprotectiontechniques.	Applying

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO3	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	-	-	-	-	-	-	-	-	-	-	-	3	3

COURSE CONTENT:

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. [9]

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 levels,Pre-emptive versus Non-Pre-emptive scheduling, Scheduling criteria, Scheduling algorithms, Multiple Processor Scheduling. [9]

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. [8]

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. [8]

UNIT-V:
File System: File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management;
File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing.
Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access smatrix. [8]

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, 2019.
2. Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition, McGraw- Hill, 2017.

E-Resources/Digital Material:
1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

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DATABASE MANAGEMENT SYSTEMS

Course Category:	**Professional Core**	Credits: 3	
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3 0 0
Prerequisites	Understanding of data concepts like data types, structures and relationships	Continuous Evaluation	30M
		Semester End Evaluation	70M
		Total Marks	100M

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Apply knowledge of database system structures and environments to analyze real world scenarios	Applying
CO2	Apply ER model for database design	Applying
CO3	Make use of SQL queries on relational database to create, maintain and manipulate a relational database.	Applying
CO4	Analyze different normalization techniques for effective database design.	Analyzing
CO5	Analyze transaction management and indexing techniques for a database.	Analyzing

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	3	3
CO2	3	-	-	-	3	-	-	-	-	-	-	3	3	3
CO3	3	-	-	-	3	-	-	-	-	-	-	3	3	3
CO4	-	3	-	-	-	-	-	-	-	-	-	3	3	3
CO5	-	3	-	-	-	-	-	-	-	-	-	3	3	3

COURSE CONTENT:

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. [9]

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). [8]

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. [8]

UNIT IV:

Schema Refinement (Normalization):Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependencyLossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Coddnormal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF). [8]

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. [9]

Text Books:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, 3rd Edition, TMH, 2014.
2. Database System Concepts, Silberschatz, Korth, Sudarsan, 7th Edition, TMH,2020.

Reference Books:

1. Introduction to Database Systems, C J Date, 8th Edition, Pearson,2006.
2. Database Management System, Ramez Elmasri, Shamkant B. Navathe, 7th Edition, Pearson, 2017.
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, 10thEdition,Cengage Learning, 2013.

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview
3. http://www.c4learn.com/
4. https://www.geeksforgeeks.org/dbms/
5. https://onlinecourses.nptel.ac.in/noc22_cs91/preview
6. https://www.tutorialspoint.com/dbms/index.htm

Regulation D23

SOFTWARE ENGINEERING

Course Category:	**Professional Core**	Credits : 3	
Course Type:	**Theory**	Lecture-Tutorial-Practice:	3 0 0
Prerequisites	Basic knowledge of algorithms, data analysis and software	Continuous Evaluation	30M
		Semester End Evaluation	70M
		Total Marks	100M

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Understand phases of software development and conventional software methods	Understanding
CO2	Utilize Empirical estimation techniques like COCOMO, Halstead's software science for project management and implement various specifications	Applying
CO3	Construct various software designs and cost models	Applying
CO4	Develop skills to design, implement, and execute test cases at various levels with quality management	Applying
CO5	Implement software maintenance, reuse approaches and make use of CASE Tools	Applying

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO3	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	-	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	-	-	-	-	-	-	-	-	-	-	-	3	3

COURSE CONTENT:

UNIT-I:

Introduction: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.

Software Life Cycle Models: Basic concepts, Water fall model and its extensions, Rapid application development, Agile development model, Spiral model. [8]

UNIT-II:

Software Project Management: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.

Requirements Analysis And Specification: Requirements gathering and analysis, Software Requirements Specification(SRS), Formal system specification, Axiomatic specification,

Algebraic specification, Executable specification and 4GL. [9]

UNIT-III:

SoftwareDesign: Overview of the design process, How to characterize a good softwaredesign?Layeredarrangementofmodules,CohesionandCoupling, approachestosoftwaredesign.

Agility: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), OtherAgileProcessModels-SCRUM,ToolSetfortheAgileProcess(TextBook2)

Function-OrientedSoftwareDesign: OverviewofSA/SDmethodology,Structuredanalysis, Developing the DFD model of a system, Structured design, Detailed design, andDesignReview.

UserInterfaceDesign: Characteristics of a gooduser interface,Basic concepts. [9]

UNIT-IV:

CodingAndTesting: Coding,Codereview,Softwaredocumentation, Testing,Black-boxtesting, White-Box testing, Debugging,Program analysis tools, Integration testing..

SoftwareReliabilityAndQualityManagement: Softwarereliability.Statisticaltesting,Software quality,Software quality management system,ISO9000.SEI Capability maturitymodel, SixSigma.

[8]

UNIT-V:

Computer-Aided Software Engineering (CASE): CASE and its scope, CASE environment,CASE support in the software life cycle, other characteristics of CASE tools, Towards secondgenerationCASEToolandArchitectureofaCASEEnvironment.

SoftwareMaintenance: Characteristicsofsoftwaremaintenance,Softwarereverse engineering,Softwaremaintenanceprocessmodelsand Estimationofmaintenancecost.

SoftwareReuse:reuse-definition,introduction,reasonbehindnoreusesofar,Basicissuesinanyreuseprogram,A reuse approach [8]

Text Books:

1. FundamentalsofSoftwareEngineering,RajibMall,5th Edition,PHI, 2018.
2. SoftwareEngineeringApractitioner'sApproach,RogerS.Pressman, 9th Edition,Mc-GrawHillInternationalEdition, 2023.

Reference Books:

1. SoftwareEngineering,IanSommerville,10th Edition,Pearson, 2017.
2. Software Engineering, Principles and practices,DeepakJain,OxfordUniversityPress,2008.

E-Resources/Digital Material:

1. https://nptel.ac.in/courses/106/105/106105182/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126058950638714 8827_shared/overview
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0133826904110039 04735_shared/overview

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OPERATING SYSTEMS LAB

Course Category:	**Professional Core**	Credits : 1.5	
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0 0 3
Prerequisites	Understanding of basics of Computer Organization and Programming	Continuous Evaluation	30 M
		Semester End Evaluation	70 M
		Total Marks	100 M

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Make use of Linux environment for Unix utilities and perform basic shell and file access control.	Applying
CO2	Solve various CPU Scheduling, deadlocks and page replacement algorithms.	Applying
CO3	Apply concepts of Inter process communication and Pthreads in operating systems.	Applying

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	3	-	-	-	-	-	-	3	3	3
CO2	3	3	-	-	3	-	-	-	-	-	-	3	3	3
CO3	3	3	-	-	3	-	-	-	-	-	-	3	3	3

COURSE CONTENT:

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 UNIX commands like cp, ls, grep, etc.,
4. Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF c) Priority d) Round Robin
5. Control the number of ports opened by the operating system with
   a) Semaphore b) Monitors.
6. Write a program to illustrate concurrent execution of threads using pthreads library.
7. Write a program to solve producer-consumer problem using Semaphores.
8. Implement the following memory allocation methods for fixed partition
   a) First fit b) Worst fit c) Best fit
9. Simulate the following page replacement algorithms a) FIFO b) LRU c) LFU
10. Simulate Paging Technique of memory management.
11. Implement Bankers Algorithm for Dead Lock avoidance and prevention
12. Simulate the following file allocation strategies a) Sequential b) Indexed c) Linked

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 System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson, 2016
3. Operating Systems -Internals and Design Principles, Stallings W, 9th Edition, Pearson, 2018

Online Learning Resources:

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

Regulation D23

DATABASE MANAGEMENT SYSTEMS LAB

Course Category:	**Professional Core**	Credits :1.5	
Course Type:	**Practical**	Lecture-Tutorial-Practice:	0 0 3
Prerequisites	Understanding of data concepts like data types, structures and relationships	Continuous Evaluation	30M
		Semester End Evaluation	70M
		Total Marks	100M

Course Outcomes:

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Analyze various SQL queries to perform operations on database	Analyzing
CO2	Examine PL/SQL programs for procedures, functions, cursors and triggers.	Analyzing
CO3	Inspect different indexing techniques on a table and JDBC concept.	Analyzing

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (1- Low, 2 – Moderate,3 – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	3	-	-	-	-	-	-	3	3	3
CO2	3	3	-	-	3	-	-	-	-	-	-	3	3	3
CO3	3	3	-	-	3	-	-	-	-	-	-	3	3	3

COURSE CONTENT:

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

Exercise 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.

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

Exercise 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)

Exercise 5: i. 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)
ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.

Exercise 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.

Exercise 7: Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT–IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.

Exercise 8: Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.

Exercise 9: Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.

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

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

Exercise 12:
Create a table and perform the search operation on table using indexing and non-indexing techniques.
Implement Indexing Using B-Trees

Exercise 13: Write a Java program that connects to a databaseusing JDBC

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

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

Text Books:

1. Oracle: The Complete Reference by Oracle Press,12c,2013.
2. Nilesh Shah, "Database Systems Using Oracle",2nd Edition PHI, 2016.
3. Rick F Vander Lans, "Introduction to SQL", 4th Edition, Pearson Education, 2007

Reference Books:

1. The Complete Reference MYSQL, Vikram Vaswani, McGraw-HillEducation,1st Edition,2017.
2. Fundamentals of Database Systems, RamezElmasri, ShamkantB. Navathe, 7th Edition, Pearson,2016.

E-Resources/Digital Material:

1. Prof Arnab Bhattacharya IIT Kanpur, SQL Introduction https://nptel.ac.in/courses/106104135/10
2. Prof Arnab Bhattacharya IIT Kanpur SQL: Updates, Joins, Views and Triggers https://nptel.ac.in/courses/106104135/11
3. Geoff Allix and Graeme Malcolm: Microsoft , Querying with Transact-SQL (edX) https://www.mooc-list.com/course/querying-transact-sql-edx

Regulation
D23

FULL STACK DEVELOPMENT –I

Course Category:	**Skill Enhancement Course**	Credits: 2			
Course Type:	**Tutorial& Practical**	Lecture-Tutorial-Practice:	0	1	2
Prerequisites	knowledge of basic web programming	Continuous Evaluation	30M		
		Semester End Evaluation	70M		
		Total Marks	100M		

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Applying the basics of full stack web development	Applying
CO2	Develop responsive web pages using HTML and CSS .	Applying
CO3	Implement client-side scripting using JavaScript and Build interactive web pages using Node.JS	Applying

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate,**3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	-	3	3	3
CO2	3	-	-	-	3	-	-	-	-	-	-	3	3	3
CO3	3	-	-	-	3	-	-	-	-	-	-	3	3	3

COURSE CONTENT:

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. 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).

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

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>, , 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

i. Simple selector (element, id, class, group, universal)

ii. Combinator selector (descendant, child, adjacent sibling, general sibling)

iii.Pseudo-class selector

iv. Pseudo-element selector

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

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

8. Java Script Conditional Statements and Loops

a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".
b. Write a program to display week days using switch case.
c. Write a program to print 1 to 10 numbers using for, while and do-while loops.
d. Write aprogram 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. Java Script Functions and Events

a. 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
b. 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)

Text Books:

1. Programming the World Wide Web, Robet W Sebesta, 7thEdition, 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, 2019.

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

Regulation
D23

Design Thinking & Innovation

Course Category:	BS&H	Credits :2	
Course Type:	**Practical**	Lecture-Tutorial-Practice:	1 0 2
		Continuous Evaluation	30M
Prerequisites	-	Semester End Evaluation	70M
		Total Marks	100M

Course Outcomes:

After Successful Completion of course, the student will be able to:

CO No:	Course Outcome Description	K - Level
CO1	Define the concepts related to design thinking.	1
CO2	Explain the fundamentals of Design Thinking and innovation.	2
CO3	Apply the design thinking techniques for solving problems in various sectors.	3
CO4	Analyse to work in a multidisciplinary environment.	4
CO5	Evaluate the value of creativity.	5

Note: K-Level is defined From Blooms Taxonomy

Contribution of Course Outcomes mapping with POs & PSOs (**1**- Low, **2** – Moderate, **3** – High)

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	-	-	2	2	-	2	-	-	-
CO2	3	3	3	3	3	2	-	-	2	2	-	2	-	-	-
CO3	3	3	3	3	3	2	-	-	2	2	-	2	-	-	-
CO4	3	3	3	3	3	2	-	-	2	2	-	2	-	-	-
CO5	3	3	3	3	3	2	-	-	2	2	-	2	-	-	-

COURSE CONTENT:

UNIT – I: Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT – II: Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

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UNIT – III: Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT – IV: Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT – V: Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, about maintenance, Reliability and plan for startup.

TEXT BOOKS:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

REFERENCE BOOKS:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

E-RESOURCES/DIGITAL MATERIAL:

1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview
4. https://onlinecourses.nptel.ac.in/noc22_de16/preview

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