PROGRAM STRUCTURE

AND

SYLLABUS

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

For

B. Tech FOUR YEARS DEGREE PROGRAM

(Applicable for batches admitted from 2024-2025)

D. N. R. COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada)

(Accredited with A^{++}Grade by NAAC & Accredited by NBA (B. Tech- CSE, ECE & EEE))

BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202

Ph: 08816-221238, Email: dnrcet@gmail.com , Website: https://dnrcet.org

VISION & MISSION OF THE INSTITUTE

VISION

To evolve as a Quality Institution in Teaching, Innovative Research, Entrepreneurship and Consultation in Engineering & Technology, empower rural youth globally competent and self-disciplined technocrats.

MISSION

IM_1: Inculcate technical knowledge, soft skills through student centric teaching & learning.

IM_2: Strengthen industry institute interaction, provide solutions to the ever-changing requirements.

IM_3: Implant entrepreneurial attitude and ethical values.

IM_4: Create work culture towards learning, Research & Development.

IM_5: Develop a unique practice that instills responsibility and accountability among the stakeholders

VISION & MISSION OF THE DEPARTMENT

VISION

To become a recognized location for qualitative Artificial Intelligence and Data Science technocrats who can comply with Research and Entrepreneurship skill set catering to global needs.

MISSION

DM1: To impart time trusted technical and soft skills catering to industrial needs.

DM2: To bridge the gap between industry and academia suiting to the dynamic requirements of the society.

DM3: To inculcate responsibility and behavioral attitude to develop accountability for future generations.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates of the Program will be

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	
PEO-1	Engage in innovative research and entrepreneurial ventures, offering impactful solutions to global challenges through the application of AI and Data Science.
PEO-2	Successfully employed as professionals in Artificial Intelligence and Data Science, utilizing strong technical and soft skills to meet evolving industrial and societal needs.
PEO-3	Demonstrate professional ethics, social responsibility, and leadership qualities, fostering a lifelong commitment to learning and accountability for future generations.

PROGRAM OUTCOMES (POs)

After successful completion of the Program, the graduates will be able to

PROGRAM OUTCOMES (POS)		
1	**Engineering Knowledge**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem Analysis**	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/Development of Solutions**	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct Investigations of Complex Problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern Tool Usage**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling 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 Sustainability**	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and Team Work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication**	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project Management and Finance**	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**Lifelong 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.

Program Specific Outcomes (PSOs)

After successful completion of the Program, the graduates will be able to

PROGRAM SPECIFIC OUTCOMES (PSOS)	
PSO-1	Apply core Artificial Intelligence and Data Science principles to solve real-world problems in various industries.
PSO-2	Develop innovative, research-driven solutions with an entrepreneurial mindset, while demonstrating ethical responsibility.

Mission of the Department – PEOs mapping

PEO Statements	DM1	DM2	DM3
PEO1: Engage in innovative research and entrepreneurial ventures, offering impactful solutions to global challenges through the application of AI and Data Science.	3	3	2
PEO2: Successfully employed as professionals in Artificial Intelligence and Data Science, utilizing strong technical and soft skills to meet evolving industrial and societal needs.	3	2	3
PEO3: Demonstrate professional ethics, social responsibility, and leadership qualities, fostering a lifelong commitment to learning and accountability for future generations.	3	2	3

Note:

Blooms Taxonomy Knowledge Level	Knowledge Level Representation
6 : Create	L6
5 : Evaluate	L5
4: Analyze	L4
3: Apply	L3
2: Understand	L2
1: Remember	L1

Mapping or Correlation Levels
1: Slight (Low)
2: Moderate (Medium)
3: Substantial (High)

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

COURSE STRUCTURE & SYLLABUS

for

B.Tech -ARTIFICIAL INTELLIGENCE and DATA SCIENCE

(Applicable for batches admitted from 2024-2025)

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B.Tech. AI&DS (DR24 Regulation I Year COURSE STRUCTURE &SYLLABUS)

B.Tech.–I Year I Semester

S.No.	Course Code	Title	Category	L/D	T	P	Credits
1.	BT24BS1101	Communicative English	BS&H	2	0	0	2
2.	BT24BS1102	Chemistry	BS&H	3	0	0	3
3.	BT24BS1103	Linear Algebra &Calculus	BS&H	3	0	0	3
4.	BT24CE1101	Basic Civil & Mechanical Engineering	Engineering Science	3	0	0	3
5.	BT24CS1101	Introduction to Programming	Engineering Science	3	0	0	3
6.	BT24BS1105	Communicative English Lab	BS&H	0	0	2	1
7.	BT24BS1106	Chemistry Lab	BS&H	0	0	2	1
8.	BT24ME1103	Engineering Workshop	Engineering Science	0	0	3	1.5
9.	BT24CS1103	Computer Programming Lab	Engineering Science	0	0	3	1.5
10.	BT24BS1108	Health and wellness, Yoga and Sports	BS&H	-	-	1	0.5
Total				**14**	**00**	**11**	**19.5**

B.Tech.–I Year II Semester

S.No.	Course Code	Title	Category	L/D	T	P	Credits
1.	BT24BS1205	Engineering Physics	BS&H	3	0	0	3
2.	BT24BS1204	Differential Equations & Vector Calculus	BS&H	3	0	0	3
3.	BT24EE1201	Basic Electrical and Electronics Engineering	Engineering Science	3	0	0	3
4.	BT24ME1201	Engineering Drawing	Engineering Science	1	0	4	3
5.	BT24CS1202	IT Workshop	Engineering Science	0	0	2	1
6.	BT24CS1201	Data Structures	Professional Core Branch specific	3	0	0	3
7.	BT24BS1209	Engineering Physics lab	BS&H	0	0	2	1
8.	BT24EE1203	Electrical and Electronics Engineering Workshop	Engineering Science	0	0	3	1.5
9.	BT24CS1203	Data Structures Lab	Professional Core Branch specific	0	0	3	1.5
10.	BT24BS1211	NSS/NCC/Scouts &Guides/Community service	BS&H	-	-	1	0.5
Total				**13**	**00**	**15**	**20.5**

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B.Tech. AI&DS (DR24 Regulation II Year COURSE STRUCTURE &SYLLABUS)

B.Tech.–II Year I Semester

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24BS2105	Discrete Mathematics& Graph Theory	BS&H	3	0	0	3
2	BT24HS2101	Universal human values – understanding harmony and Ethical human conduct	BS&H	2	1	0	3
3	BT24DS2101	Database Management Systems	Engineering Science	3	0	0	3
4	BT24CS2101	Advanced Data Structures Algorithms Analysis	Professional Core	3	0	0	3
5	BT24CS2102	Object Oriented Programming Through Java	Professional Core	3	0	0	3
6	BT24CS2103	Advanced Data Structures And Algorithms Analysis Lab	Professional Core	0	0	3	1.5
7	BT24CS2104	Object Oriented Programming Through Java Lab	Professional Core	0	0	3	1.5
8	BT24CS2105	Python Programming Lab	Skill Enhancement Course	0	1	2	2
9	BT24BS2106	Environmental Science	Audit Course	2	0	0	-
Total				**16**	**2**	**8**	**20**

B.Tech–II Year II Semester

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24HS2201	Managerial Economic and Financial Analysis	Management Course- I	2	0	0	2
2	BT24BS2203	Statistical Methods for Data science	Engineering Science/ Basic Science	3	0	0	3
3	BT24DS2201	Artificial Intelligence	Professional Core	3	0	0	3
4	BT24DS2202	Introduction to Data Science	Professional Core	3	0	0	3
5	BT24EC2208	Digital Logic & Computer Organization	Professional Core	3	0	0	3
6	BT24DS2203	Artificial Intelligence Lab	Professional Core	0	0	3	1.5
7	BT24DS2204	Data Science using Python Lab	Professional Core	0	0	3	1.5
8	BT24CS2206	Full Stack Development-1	Skill Enhancement Course	0	1	2	2
9	BT24ME2207	Design Thinking & Innovation	BS&H	1	0	2	2
Total				**15**	**1**	**10**	**21**
10	Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - I Semester	Course Code: BT24BS2105	L	T	P	C
		3	0	0	3
DISCRETE MATHEMATICS AND GRAPH THEORY					

Course Objectives:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

Course Outcomes: At the end of the course students will be able to

CO1: Build skills in solving mathematical problems (L3)

CO2: Comprehend mathematical principles and logic (L4)

CO3: Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software (L6)

CO4: Manipulate and analyze data numerically(L3).

CO5: Analyze data graphically sing appropriate Software (L4)

CO6: How to communicate effectively mathematical ideas / results verbally or in writing (L2)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3.00	3.00	2.00	-	-	-	-	2.00	-	-	-	2.00
CO2	3.00	3.00	1.00	-	-	-	-	2.00	-	-	-	2.00
CO3	3.00	3.00	2.00	-	-	-	-	2.00	-	-	-	2.00
CO4	3.00	3.00	2.00	-	-	-	-	2.00	-	-	-	-
CO5	3.00	2.00	1.00	-	-	-	-	2.00	-	-	-	2.00
CO6	3.00	3.00	2.00	-	-	-	-	2.00	-	-	-	2.00

	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

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.

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.

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,

Unit-V: Multi Graphs

Multi graphs, 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.
2. Elements of Discrete Mathematics – A Computer Oriented Approach, C. L. Liuand D. P. Mohapatra, 3rdEdition,Tata McGraw Hill.
3. Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.

REFERENCEBOOKS:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J.L. Mott, A. Kandel

and T. P. Baker, 2nd Edition, Prentice Hall of India.

2. Discrete Mathematical Structures, Bern and Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3. Discrete Mathematics, S.K. Chakraborthy and B.K. Sarkar, Oxford, 2011.
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7^{th} Edition, Tata McGraw Hill.

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - I Semester	Course Code: BT24HS2101	L	T	P	C
		2	1	0	3

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

Course Objectives:

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

Course Outcomes:

CO1: Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2)

CO2: Identify one's self, and one's surroundings (family, society nature) (L1, L2)

CO3: Apply what they have learnt to their own self indifferent day - to - day settings in real life (L3)

CO4: Relate human values with human relationship and human society. (L4)

CO5: Justify the need for universal human values and harmonious existence (L5)

CO6: Develop as socially and ecologically responsible engineers (L3, L6).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	3.00	3.00	-	2.00	-	3.00
CO2	-	-	-	-	-	-	-	3.00	2.00	2.00	-	3.00
CO3	-	-	-	-	-	-	-	3.00	2.00	-	-	2.00
CO4	-	-	-	-	-	-	3.00	3.00	2.00	2.00	-	3.00
CO5	-	-	-	-	-	-	3.00	3.00	-	-	-	3.00
CO6	-	-	-	-	-	3.00	3.00	2.00	2.00	-	-	2.00

	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Course Topics

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

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

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

Lecture1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about One self

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

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.

Lecture8: 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

Lecture12: Programme to ensure self – regulation and Health

Tutorial6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III: Harmony in the Family and Society(6 lectures and 3tutorials 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

Lecture18: Vision for the Universal Human Order

Tutorial9: Practice Session PS9 Exploring Systems to fulfil Human Goal

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

Lecture19: Understanding Harmony in the Nature

Lecture 20: Inter connectedness, 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

Lecture22: The Holistic Perception of Harmony in Existence

Tutorial11: 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

Tutorial12: Practice Session PS12 Exploring Ethical Human Conduct

Lecture25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture26: Competence in Professional Ethics

Tutorial13: Practice Session PS13 Exploring Humanistic Models in Education

Lecture27: Holistic Technologies, Production Systems and Management Models-Typical

Case Studies

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

Tutorial14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education PS1 Sharing about Oneself

PS2 Exploring Human Consciousness PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being

PS4 Exploring the difference of Needs of self and body

PS5 Exploring Sources of Imagination in the self

PS6 Exploring Harmony of self with the body

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

PS7 Exploring the Feeling of Trust

PS8 Exploring the Feeling of Respect

PS9 Exploring Systems to fulfil Human Goal

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

PS10 Exploring the Four Orders of Nature

PS11 Exploring Co-existence in Existence

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

PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education

PS14 Exploring Steps of Transition towards Universal Human Order

READINGS:

Textbook and Teachers Manual

1. 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

2. 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. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.

2. Huma Values, A.N.Tripathi, New AgeIntl. 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 – JC Kumarappa
8. Bharat Mein Angreji Raj –PanditSunderlal
9. Rediscovering India – by Dharampal
10. Hind Swarajor Indian Home Rule – by Mohandas K.Gandhi
11. India Wins Freedom – Maulana Abdul Kalam Azad
12. Vivekananda – Romain Rolland (English)
13. Gandhi – Romain Rolland (English)

Mode of Conduct:

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

Tutorial hours are to be used for practice sessions.

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

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

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

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

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

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

Online Resources:

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

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - I Semester	Course Code: BT24DS2101	L	T	P	C
		3	0	0	3
DATABASE MANAGEMENT SYSTEMS					

Course Objectives:

The main objectives of the course is to

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

Course Outcomes

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

CO1: Determine the basic concept and applications of database system (L3)

CO2: Describe the data models and schemes in Database Management Systems (L3)

CO3: Understand the relational databases system using relational operators in queries (L2)

CO4: Use SQL standard language queries on database (L6)

CO5: Analysis the functional dependencies and design of database (L4)

CO6: Apply the issues of managing the data such as efficiency, privacy, security and ethical responsible (L3)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3.00	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3.00	2.00	-	-	-	-	-	-	-	-
CO3	-	-	2.00	3.00	-	-	-	-	-	-	-	-
CO4	2.00	2.00	2.00	-	3.00	-	-	-	-	-	-	-
CO5	1.00	-	-	-	3.00	-	-	-	-	-	-	-
CO6	2.00	3.00	-	3.00	-	-	-	-	-	-	-	-

	PSO1	PSO2
CO1	-	2.00
CO2	2.00	3.00
CO3	2.00	3.00
CO4	-	3.00
CO5	3.00	-
CO6	-	-

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

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

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

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

UNIT V: Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock

based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm. Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based
Indexing.

Text Books:

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

Reference Books:

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

Web-Resources:

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

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - I Semester	**Course Code: BT24CS2101**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS					

Course Objectives:

The main objectives of the course is to

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

Course Outcomes:

At the end of the course students will be able to

CO1: Analyze worst-case running times of algorithms using asymptotic analysis (L4).

CO2: Apply Divide-and-conquer paradigm and explain when an algorithmic design situation calls for it (L3).

CO3: Apply Greedy Method paradigm (L3).

CO4: Develop dynamic programming algorithms for various real time applications (L6).

CO5: Illustrate and apply backtracking algorithms, further able to understand non-deterministic algorithms (L3).

CO6: Solve NP Completeness of problems (L5).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3.00	3.00	3.00	-	3.00	-	-	-	-	-	-	-
CO2	-	2.00	3.00	-	-	-	-	-	-	-	-	-
CO3	2.00	-	-	2.00	-	-	-	-	-	-	-	-
CO4	-	-	2.00	3.00	-	-	-	-	-	-	-	-
CO5	2.00	-	-	-	3.00	-	-	-	-	-	-	-
CO6	-	3.00	-	3.00	2.00	-	-	-	-	-	-	-

	PSO1	PSO2
CO1	3.00	-
CO2	-	2.00
CO3	-	3.00
CO4	2.00	-
CO5	1.00	2.00
CO6	2.00	-

UNIT–I:

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations. AVL Trees – Creation, Insertion, Deletion operations and Applications B-Trees – Creation, Insertion, Deletion operations and Applications

UNIT–II:

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

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

Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

UNIT–III:

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths

Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths – General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem.

UNIT–IV:

Back tracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem

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

UNIT–V:

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem

NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Sales person Decision Problem (TSP)

NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

Textbooks:

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni,S artaj; Mehta, Dinesh 2nd Edition Universities Press

2. Computer Algorithms/C++ Ellis Horowitz, SartajSahni, Sanguthevar Rajasekaran 2nd Edition University Press

Reference Books:

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

Online Learning Resources:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. AbdulBari,1.IntroductiontoAlgorithms(youtube.com)

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - I Semester	Course Code: BT24CS2102	L	T	P	C
		3	0	0	3
OBJECT-ORIENTED PROGRAMMING THROUGH JAVA					

Course Objectives:

The learning objectives of this course are to:

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

Course Outcomes:

At the end of the course students will be able to

CO1: Realize the concept of object oriented programming & Java programming constructs (L2).

CO2: Describe the basic concept of java such as operators, classes, objects (L2).

CO3: Describe the basic concept of java such as inheritance, packages, enumeration and various keywords (L2).

CO4: Apply the concepts of exception handling and Input / Output operations (L3).

CO5: Design the applications of Java & Java applet (L6)

CO6: Analyze & design the concept of Event handling and abstract window toolkit (L6)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3.00	2.00	2.00	1.00	-	-	-	-	-	-	-	-
CO2	3.00	2.00	2.00	1.00	-	-	-	-	-	-	-	-
CO3	3.00	2.00	3.00	2.00	-	-	-	-	-	-	-	-
CO4	3.00	1.00	2.00	2.00	-	-	-	-	-	-	-	-
CO5	2.00	3.00	3.00	-	-	-	-	-	-	-	-	-
CO6	1.00	2.00	2.00	2.00	-	-	-	-	-	-	-	-

	PSO1	PSO2
CO1	2.00	-
CO2	2.00	-
CO3	-	-
CO4	-	-
CO5	-	2.00
CO6	-	-

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, TernaryOperator?:,SwitchStatement,IterationStatements,whileExpression,do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II: Classes and Objects: Introduction, Class Declaration and Modifiers, ClassMembers,DeclarationofClassObjects,AssigningOneObjecttoAnother,AccessControl for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

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

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

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

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

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-un boxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time. Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

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

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

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

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

Java Database Connectivity: Introduction, JDBC Architecture, Installing My SQL and My SQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

Text Books:

1. JAVA one step ahead, Anitha Seth, B.L. Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta,

Monalisa Sarma, Cambridge, 2023.

3. JAVA9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:

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

Online Resources:

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

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - I Semester	**Course Code: BT24CS2103**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**
ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB					

Course Objectives:

The objectives of the course is to

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

Course Outcomes:

At the end of the course students will be able to

CO1: Analyze algorithms and determine algorithm correctness and time efficiency classes (L4)

CO2: Develop Programs for implementing trees and their traversal operations (L6)

CO3: Apply algorithm design techniques (L3)

CO4: Apply Greedy, divide and conquer algorithms (L3)

CO5: Develop dynamic programming algorithms for various real-time applications (L6)

CO6: Illustrate and apply backtracking algorithms, further able to understand non-deterministic algorithms (L4)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3.00	3.00	3.00	3.00	3.00	-	-	-	-	-	-	2.00
CO2	-	3.00	3.00	-	-	-	-	-	-	-	-	3.00
CO3	3.00	-	-	3.00	3.00	-	-	-	-	-	-	2.00
CO4	-	3.00	3.00	3.00	-	-	-	-	-	-	-	3.00
CO5	3.00	-	-	-	3.00	-	-	-	-	-	-	3.00
CO6	3.00	3.00	-	3.00	3.00	-	-	-	-	-	-	2.00

	PSO1	PSO2
CO1	3.00	3.00
CO2	-	3.00
CO3	-	3.00
CO4	3.00	-
CO5	3.00	3.00
CO6	3.00	-

Experiments covering the Topics:

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

Sample Programs:

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by
   a) Adjacency Matrix b)Adjacency Lists
5. Write a program for finding the bi-connected components in a given graph.
6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
8. Implement Job sequencing with deadlines using Greedy strategy.
9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
10. Implement N-Queens Problem Using Back tracking.
11. Use Back tracking strategy to solve 0/1 Knapsack problem.
12. Implement Travelling Sales Person problem using Branch and Bound approach.

Reference Books:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, Sahni Sartaj, Mehta, Dinesh,2nd Edition, Universities Press
2. Computer Algorithms /C++ Ellis Horowitz, Sartaj Sahni, Sanguthe var Rajasekaran, 2nd Edition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill

Online Learning Resources:

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

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - I Semester	Course Code: BT24CS2104	L	T	P	C
		0	0	3	1.5
OBJECT-ORIENTED PROGRAMMING THROUGH JAVA LAB					

Course Objectives:

The aim of this course is to

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

Course Outcomes:

At the end of the course students will be able to

CO1: Apply control structures and operators for writing basic python programs (L3).

CO2: List various python data structure concepts and apply them to solve real world problems (L3).

CO3: Develop functions and examine various file handling techniques and apply them to solve real world problems (L6).

CO4: Build simple Modules used for solving real world Problems (L6).

CO5: Analyze object oriented concepts in Python (L4).

CO6: Develop, test various GUI application (L6).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3.00	2.00	1.00	2.00	2.00							2.00
CO2	3.00	2.00	2.00	2.00	3.00							3.00
CO3	3.00	2.00	3.00	2.00	2.00							2.00
CO4	3.00	3.00	1.00	2.00	3.00							3.00
CO5	3.00	2.00	3.00	2.00	2.00							3.00
CO6	3.00	3.00	3.00	2.00	3.00							2.00

	PSO1	PSO2
CO1	3.00	3.00
CO2	2.00	2.00
CO3	1.00	1.00
CO4	3.00	3.00
CO5	1.00	1.00
CO6	3.00	3.00

Experiments covering the Topics:

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

Sample Experiments:

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 $ax^2+bx=0$. 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 implements method over loading.

c) Write a JAVA program to implement constructor.

d) Write a JAVA program to implement construct or over loading.

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” key word.

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

- Write a JAVA program for creation of Java Built-in Exceptions
- 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" every1sec, the second thread displays "Hello" every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable)

b) Write a program illustrating **isAlive** and **join()**

c) Write a Program illustrating Daemon Threads.

d) Write a JAVA program Producer Consumer Problem

Exercise–8

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

Exercise–9

1. Write a java program that connects to a database using JDBC
   a) Write a java program to connect to a database using JDBC and insert values in to it.
   b) Write a java program to connect to a database using JDBC and delete values from it.

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - I Semester	**Course Code: BT24CS2105**	**L**	**T**	**P**	**C**
		0	**1**	**2**	**2**
PYTHON PROGRAMMING LAB (Skill Enhancement Course)					

Course Objectives:

The main objectives of the course are to

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

Course Outcomes:

At the end of the course students will be able to

CO1: Develop essential programming skills in computer programming concepts like datatypes, containers (L3)

CO2: Apply the basic of programming in the Python Language (L3)

CO3: Apply ode tasks related to conditional executions and loops (L3)

CO4: Apply coding tasks related to fundamental notations and techniques used in object oriented programming (L3)

CO5: Design and implement a program to solve a real world problem (L6)

CO6: Create a database connectivity in python programming language (L6)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3.00	2.00	3.00	-	2	-	-	-	-	-	-	2.00
CO2	3.00	3.00	3.00	-	2	-	-	-	-	-	-	2.00
CO3	3.00	3.00	3.00	-	2	-	-	-	-	-	-	2.00
CO4	3.00	2.00	2.00	-	2	-	-	-	-	-	-	2.00
CO5	3.00	3.00	3.00	-	3	-	-	-	-	-	-	2.00
CO6	3.00	2.00	2.00	-	2	-	-	-	-	-	-	2.00

	PSO1	PSO2
CO1	3.00	3.00
CO2	2.00	2.00
CO3	3.00	3.00
CO4	2.00	2.00
CO5	3.00	3.00
CO6	3.00	3.00

UNTI-I: History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupiter Notebook.

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

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

Sample Experiments:

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

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

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

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

Sample Experiments:

1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. 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. Addition ii. Insertion iii. slicing
6. Write a program to perform any 5 built-in functions by taking any list.

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

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

Sample Experiments:

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

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

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

Sample Experiments:

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

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

Sample Experiments:

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

Reference Books:

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

Online Learning Resources / Virtual Labs:

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

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - I Semester	**Course Code: BT24BS2106**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**-**
ENVIRONMENTAL SCIENCE					

Course Objectives:

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

Course Outcomes:

At the end of the course students will be able to

CO1: Grasp multidisciplinary nature of environmental studies and various renewable and non-renewable resources (L3).

CO2: Understand flow and bio-geo-chemical cycles and ecological pyramids (L2).

CO3: Understand various causes of pollution and solid waste management (L2).

CO4: Understand the various causes of pollution and its related preventive measures (L4).

CO5: About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation (L4).

CO6: Casus of population explosion, value education and welfare programmes (L3).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3.00	2.00	3.00	-	-	3.00	2.00	-	2.00	2.00	-	3.00
CO2	3.00	2.00	-	-	-	3.00	2.00	-	3.00	3.00	-	3.00
CO3	3.00	-	-	-	-	2.00	3.00	-	2.00	2.00	-	3.00
CO4	2.00	-	2.00	-	-	2.00	3.00	-	2.00	2.00	-	3.00
CO5	2.00	2.00	2.00	-	-	2.00	3.00	-	2.00	2.00	-	3.00
CO6	2.00	2.00	2.00	-	-	3.00	3.00	-	2.00	2.00	-	2.00

	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

UNIT–I

Multidisciplinary Nature of Environmental Studies:– Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people –Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams– benefits and problems–Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT–II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grass land ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its Conservation: Introduction and Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels– India as a mega- diversity nation– Hot-sports of biodiversity–Threats to biodiversity: habitat loss, poaching of wildlife, man- wildlife conflicts – Endangered and endemic species of India– Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT–III

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–IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, water shed 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 – Wasteland 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–V

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest 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. Text book of Environmental Studies for Undergraduate Erach Bharucha, Courses, Universities Press (India) Private Limited, 2019.
2. Palani swamy, Environmental Studies,2/e,Pearsoneducation,2014.
3. S. Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

Reference Books:

1. Deeksha Dave and E. Sai Baba Reddy,Textbook of Environmental Science, 2/e, Cengage Publications, 2012.
2. Deeksha Daveand E. Sai Baba Reddy,Textbook of Environmental Science, 2/e, Cengage Publications, 2012.
3. M.Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, 2014.
4. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
5. J.Glynn Henry and GaryW.Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.
6. G.R.Chatwal, A TextBook of Environmental Studies, Himalaya Publishing House, 2018.
7. Gilbert M. Masters and Wendel lP. Ela, Introduction to Environmental Engineering and Science, 1/e, Prentice Hall of India Private limited, 1991.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc23_hs155/preview
- https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental-science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-d84c-4773-8388-1b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science+ +Part+3%3A+Pollution+and+Resources&source=edX&product_category=course&placem

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - II Semester	Course Code: BT24HS2201	L	T	P	C
		2	0	0	2
MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS					

Course Objectives:

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

Course Outcomes:

CO1: Define the concepts related to Managerial Economics, financial accounting and management (L2)

CO2: Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2)

CO3: Apply the Concept of Production cost and revenues for effective Business decision (L3)

CO4: Analyze how to invest their capital and maximize returns (L4)

CO5: Evaluate the capital budgeting techniques.(L5)

CO6: Develop the accounting statements and evaluate the financial performance of business entity (L6)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2.00	2.00	3.00	-	2.00	-	-	-	-	-	-
CO2	-	3.00	3.00	3.00	2.00	-	-	-	-	-	-	-
CO3	-	-	2.00	-	2.00	-	-	-	-	-	-	-
CO4	-	-	-	-	-	1.00	2.00	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-

	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

UNIT-I Managerial Economics

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

UNIT-II Production and Cost Analysis

Introduction–Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Shortrun and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

UNIT-III Business Organizations and Markets

Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies-PublicSectorEnterprises.TypesofMarkets-PerfectandImperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies

UNIT-IV Capital Budgeting

Introduction–Nature, meaning, significance. 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– PayBack Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

UNIT-V Financial Accounting and Analysis

Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and

Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

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

Online Learning Resources:

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

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - II Semester	**Course Code: BT24BS2203**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
STATISTICAL METHODS FOR DATA SCIENCE					

Course Objectives: This course aims at providing knowledge on basic concepts of Statistics, Estimation and testing of hypotheses for large and small samples**.**

Course Outcomes: Student will be able to

CO1: Analyze data and draw conclusion about collection of data and fitting of distributions (L4)

CO2: Analyzing the testing of hypothesis for Large and small samples (L4)

CO3: Understand the concepts and meaning of regression coefficients and their relationship with correlation coefficient.(L2)

CO4: Determine regression lines and model a best suitable curve for a given data using method of least squares.(L3)

CO5: Find various time series methods and apply in different fields(L3)

CO6: Understanding the classification using Logistic Regression(L2)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2.00	3.00	1.00	-	-	-	-	-	-	-	-	2.00
CO2	2.00	2.00	1.00	-	-	-	-	-	-	-	-	1.00
CO3	2.00	2.00	2.00	-	-	-	-	-	-	-	-	1.00
CO4	2.00	2.00	-	-	-	-	-	-	-	-	-	1.00
CO5	2.00	2.00	2.00	-	-	-	-	-	-	-	-	1.00
CO6	2.00	2.00	2.00	-	-	-	-	-	-	-	-	-

	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

UNIT–I: Data Visualization and Distributions

Data Visualization Techniques: Introduction to Statistical methods- Exploratory Data Analysis-Charts (Line, Pie, Bar); Plots (Bubble, Scatter); Maps (Heat, Dot Distribution); Diagrams (Trees and Matrices)-Principal Components Analysis.

Introduction to Data Distributions - Probability Distributions – discrete (binomial, Poisson), Continuous Distributions (Normal, exponential).

UNIT–II: Hypothesis Testing

Introduction to Parametric Estimation – Parametric Confidence Intervals

Choosing a Statistic - Hypothesis Testing - Parametric test: the T-test - Applications to Hypothesis Tests- Pair wise comparisons.

UNIT-III: Linear Regression and Multiple Regression

Regression: Linear Regression, Curvilinear Regression: Exponential Regression- Polynomial Regression- Power Model.

Practical Examples - The nature of the 'relationship' - Multiple Linear Regression - Important measurements of the regression estimate - Multiple Regression with Categorical Explanatory Variables - Inference in Multiple Regression - Variable Selection.

UNIT-IV: Time Series

Time series: Significance of Time series analysis, Components of Time series, Secular trend: Graphic method, Semi-average method, Method of moving averages, Method of least squares: straight line and non-linear trends, Logarithmic methods –Exponential trends, Growth curves, Seasonal Variations: Method of simple averages, Ratio-to-trend method, ratio-to-moving average method, Link relative method.

(Text book: K. Murugesan, P. Gurusamy , "Probability, Statistics and Random Processes"**) UNIT-V: Logistic Regression**

The classification problem – Logistic Regression Setup – Inter preting the Results - Comparing Models - Classification Using Logistic Regression.

Textbooks:

1. Elizabeth Purdom,"Statistical methods for Data science"
2. K. Murugesan, P.Gurusamy, "Probability, Statistics and Random Processes"

Reference Books:

1. Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference – Testing of Hypotheses, Prentice Hall of India, 2014.
2. Robert V Hogg, Elliot A Tannis and Dale L.Zimmerman, Probability and Statistical Inference,9th edition, Pearson publishers,2013.
3. Chris Chatfield, "The analysis of time series an introduction," 5th edition, Chapman & Hall/CRC.
4. Peter J. Brockwell, Richard A. Davis, "Introduction to Time series and Forecasting," Second edition, Springer.

Online Learning Resources: epurdom.github.io/Stat131A/Rsupport/index.html.

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - II Semester	Course Code: BT24DS2201	L	T	P	C
		3	0	0	3
ARTIFICIAL INTELLIGENCE					

Pre-requisite:

1. Knowledge in Computer Programming.
2. A course on "Mathematical Foundations of Computer Science".
3. Back ground in linear algebra, data structures and algorithms, and probability.

Course Objectives:

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

Course Outcomes: Student will be able to

CO1: Describe the fundamental concepts, history, and foundations of Artificial Intelligence, including the structure of intelligent agents. (L2)

CO2: Apply uninformed and heuristic search algorithms to solve AI problems and simulate intelligent behavior in game-playing environments. (L3)

CO3: Analyze and compare different knowledge representation techniques such as predicate logic, semantic networks, and rule-based systems. (L4)

CO4: Evaluate reasoning under uncertainty using probabilistic methods like Bayesian inference and Dempster-Shafer theory. (L5)

CO5: Develop AI solutions using logic-based reasoning techniques, including forward/backward chaining, resolution, and learning models like decision trees and reinforcement learning (L3,L6).

CO6: Illustrate the architecture and functionalities of expert systems, and explain their applications in real-world problem solving (L3).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	1	-	-	-	-	-	-	-
CO2	3	2	3	2	3	-	-	-	-	-	-	1
CO3	3	3	2	-	2	-	-	-	-	-	-	-
CO4	3	3	2	3	3	-	-	-	-	-	-	2
CO5	3	3	3	2	3	-	-	-	1	2	2	2
CO6	3	2	3	2	2	-	-	-	1	2	-	2

	PSO1	PSO2
CO1	3	-
CO2	3	2
CO3	3	3
CO4	3	3
CO5	3	3
CO6	3	3

UNIT – I: Introduction: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT – II: Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* , AO* Algorithms, Problem reduction, Game Playing- Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions

UNIT – III: Representation of Knowledge: Knowledge representation issues, predicate logic-logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and dempster shafer theory.

UNIT – IV: Logic concepts: First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

UNIT – V: Expert Systems: Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.

Textbooks:

1. S.Russel and P.Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B.,“Artificial Intelligence (SIE)”, McGrawHill.

Reference Books:

1. David Poole, Alan Mackworth, Randy Goebel, ”Computational Intelligence: a logical approach”, Oxford University Press.
2. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem solving”, Fourth Edition, Pearson Education.
3. Nilsson,“ArtificialIntelligence:AnewSynthesis”,ElsevierPublishers.
4. Artificial Intelligence, Saroj Kaushik, CENGAGE Learning.

Online Learning Resources:

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

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - II Semester	**Course Code: BT24DS2202**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
INTRODUCTION TO DATA SCIENCE					

Course Objectives: From the course the student will learn

- Knowledge and expertise to become a data scientist.
- Essential concepts of statistics and machine learning that a revital for data science;
- Significance of exploratory data analysis (EDA) in data science.
- Critically evaluate data visualizations presented on the dash boards
- Suitability and limitations of tools and techniques related to data science process

Course Outcomes: Student will be able to

CO1: Identify data science workflow, including data collection, cleaning, analysis, and visualization(L2)

CO2: Essential concepts of statistics and machine learning that are vital for data science(L4)

CO3: Learn about big data technologies (Hadoop, Spark) and cloud platforms(L4)

CO4: Apply the data science process for the case study disease diagnosis and profiling(L3)

CO5: Use tools like Matplotlib, Seaborn, or Tableau for data visualization(L6)

CO6: Create dashboards and reports for effective data communication(L3)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	1	-	-	-	-	-	-	-
CO2	3	2	3	2	3	-	-	-	-	-	-	1
CO3	3	3	2	-	2	-	-	-	-	-	-	-
CO4	3	3	2	3	3	-	-	-	-	-	-	2
CO5	3	3	3	2	3	-	-	-	1	2	2	2
CO6	3	2	3	2	2	-	-	-	1	2	-	2

	PSO1	PSO2
CO1	3	-
CO2	3	2
CO3	3	3
CO4	3	3
CO5	3	3
CO6	3	3

UNIT I: Introduction to Data science, benefits and uses, facets of data, data science process in brief, big data ecosystem and data science.

Data Science process: Overview, defining goals and creating project charter, retrieving data, cleansing, integrating and transforming data, exploratory analysis, model building, presenting findings and building applications on top of them

Unit II: Applications of machine learning in Data science, role of ML in DS, Python tools like sklearn, modelling process for feature engineering, model selection, validation and prediction, types of ML, semi-supervised learning.

Handling large data: problems and general techniques for handling large data, programming tips for dealing large data, case studies on DS projects for predicting malicious URLs, for building recommender systems.

UNIT III: NoSQL movement for handling Big data: Distributing data storage and processing with Hadoop frame work, case study on risk assessment for loan sanctioning, ACID principle of relational databases, CAP theorem, base principle of NoSQL databases, types of NoSQL databases, case study on disease diagnosis and profiling

UNIT IV: Tools and Applications of Data Science: Introducing **Neo4j** for dealing with graph databases, graph query language **Cypher**, Applications graph databases, Python libraries like nltk and SQLite for handlingText mining and analytics, case study on classifying Reddit posts

UNIT V: Data Visualization and Prototype Application Development: Data Visualization options, Cross filter, the Java Script Map Reduce library, Creating an interactive dash board with dc.js, Dashboard development tools. Applying the Data Science process for real world problem solving scenarios as a detailed case study.

Textbook:

1) Davy Cielen, Arno D.B. Meysman, and Mohamed Ali, “Introducing to Data Science using Python tools”, Manning Publications Co, Dream tech press, 2016
2) Prateek Gupta,“DataScience with Jupyter” BPB publishers, 2019 for basics

Reference Books:

1) Joel Grus, “Data Science From Scratch”, OReilly, 2019.
2) Doing Data Science: Straight Talk From The Frontline, 1st Edition, Cathy O’Neil and Rachel Schutt, O’Reilly, 2013.

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - II Semester	Course Code: BT24EC2208	L	T	P	C
		3	0	0	3
DIGITAL LOGIC & COMPUTER ORGANIZATION					

Course Objectives:

The main objectives of the course ist o

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

Course Outcomes:

At the end of the course students will be able to

CO1: Learn different number systems and basic structure of computer system (L3)

CO2: Demonstrate the arithmetic algorithms (L4)

CO3: Explain the basic concepts of digital components and processor organization (L3)

CO4: Explain the generations of control signals of computer (L3)

CO5: Demonstrate the memory organization (L4)

CO6: Describe the concepts of parallel processing and different buses (L3)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3.00	2.00	1.00	-	-	-	-	-	-	-	-	-
CO2	1.00	-	-	2.00	-	-	-	-	-	-	-	-
CO3	1.00	2.00	2.00	-	-	-	-	-	-	-	-	-
CO4	3.00	-	3.00	1.00	-	-	-	-	-	-	-	-
CO5	3.00	2.00	-	3.00	-	-	-	-	-	-	-	-
CO6	3.00	1.00	2.00	2.00	-	-	-	-	-	-	-	-

	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	2
CO6	-	3

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

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

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

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

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

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

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

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

Textbooks:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 6th edition, McGraw Hill, 2023.
2. Digital Design, 6th Edition, M.Morris Mano, Pearson Education, 2018.
3. Computer Organization and Architecture, William Stallings, 11th Edition, Pearson, 2022.

Reference Books:

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

OnlineLearningResources:

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

D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY (Autonomous)
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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - II Semester	Course Code: BT24DS2203	L	T	P	C
		0	0	3	1.5
ARTIFICIAL INTELLIGENCE LAB					

Pre-requisite:

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

Course Objectives:

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

Course Outcomes: Student will be able to

CO1: Demonstrate the use of Python libraries like Pandas for data manipulation and visualization(L3)

CO2: Implement and analyze classical search algorithms (BFS, DFS, Best First, A*, AO*) in AI(L4)

CO3: Apply heuristic approaches to solve real-world AI problems such as the Water Jug and 8-Puzzle problems(L3)

CO4: Implement and evaluate intelligent strategies like Alpha-Beta pruning and default reasoning in decision making(L5)

CO5: Design and build expert systems using unification and knowledge base structures(L6).

CO6: Integrate various AI techniques to develop simple games and scheduling applications(L6)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	-	-	-	1	2	-	-
CO2	3	3	3	2	2	-	-	-	-	2	-	1
CO3	3	3	3	3	2	-	-	-	-	2	-	2
CO4	3	3	3	3	3	-	-	-	-	3	2	2
CO5	3	2	3	2	2	-	-	-	2	2	-	2
CO6	3	3	3	3	3	-	-	-	2	3	2	2

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	3
CO4	3	3
CO5	3	3
CO6	3	3

List of Experiments

1. Pandas Library
    a) Write a python program to implement Pandas Series with labels.
    b) Create a Pandas Series from a dictionary.
    c) Creating a Pandas Data Frame.
    d) Write a program which makes use of the following Pandas methods
        i) describe() ii)head() iii)tail() iv)info()
2. Pandas Library: Visualization
    a) Write a program which use pandas in built visualization top lot following graphs:
        i.Barplots ii.Histograms iii.Lineplots iv.Scatterplots
3. Write a Program to Implement Breadth First Search using Python.
4. Write a program to implement Best First Searching Algorithm
5. Write a Program to Implement Depth First Search using Python.
6. Write a program to implement the Heuristic Search
7. Write a python program to implement A* and AO* algorithm. (Ex: find the shortest path)
8. Write a Program to Implement Water – Jug problem using Python.
9. Write a Program to Implement Alpha-Beta Pruning using Python.
10. Write a Program to implement 8- Queens Problem using Python.
11. Write a program to schedule a meeting among a 5 busy people using Default Reasoning the output should give the time, place and day of the meeting.
12. Write a program to implement the Unification algorithm
13. Develop a knowledge base system consisting of facts and rules about some specialized knowledge domain
14. Write a program to implement 8 puzzle programs using different heuristics. Using it play the game Tic-Tac-Toe at the end the game the program should display the no. of nodes generated, cutoff values at each stage in the form of a table.

Textbooks:

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

Reference Books:

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

Online Learning Resources:

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

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - II Semester	**Course Code: BT24DS2204**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**
DATA SCIENCE USING PYTHON LAB					

Course Objectives:

- The main objective of the course is to inculcate the basic understanding of Data Science and its practical implementation using Python.

Course Outcomes: Student will be able to

CO1: Understand the basics of NumPy arrays and their role in scientific computing(L2)

CO2: Construct NumPy arrays using various methods such as zeros, ones, and random(L6)

CO3: Create custom NumPy arrays for specific use cases and analyze their properties(L3)

CO4: Demonstrate the ability to initialize and inspect identity matrices(L3)

CO5: Analyze evenly spaced values using NumPy functions(L4)

CO6: Evaluate and compare different array creation methods for efficiency(L5)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	2	-	-	-	-	-	-	-
CO2	3	2	3	2	2	-	-	-	-	-	-	-
CO3	3	2	3	2	2	-	-	-	-	-	-	2
CO4	3	2	2	-	2	-	-	-	-	-	-	-
CO5	3	2	2	3	2	-	-	-	-	-	-	2
CO6	3	3	3	3	3	-	-	-	-	-	-	2

	PSO1	PSO2
CO1	2	1
CO2	2	2
CO3	3	2
CO4	2	2
CO5	3	2
CO6	3	3

List of Experiments

1. Creating a NumPy Array
    a. Basic nd array
    b. Array of zeros
    c. Array of ones
    d. Random numbers in nd array
    e. An array of your choice
    f. Imatrix in NumPy
    g. Evenly spaced nd array
2. The Shape and Reshaping of NumPy Array
    a. Dimensions of NumPyarray
    b. Shape of NumPy array
    c. Size of NumPy array
    d. Reshaping a NumPy array
    e. Flattening a NumPy array
    f. Transpose of a NumPy array
3. Expanding and Squeezing a NumPy Array
    a. Expanding a NumPy array
    b. Squeezing a NumPy array
    c. Sorting in NumPy Arrays
4. Indexing and Slicing of NumPy Array
    a. Slicing 1-D NumPy arrays
    b. Slicing 2-D NumPy arrays
    c. Slicing 3-D NumPy arrays
    d. Negative slicing of NumPy arrays
5. Stacking and Concatenating Numpy Arrays
    a. Stacking nd arrays
    b. Concatenating nd arrays
    c. Broadcasting in Numpy Arrays
6. Perform following operations using pandas
    a. Creating data frame

b. concat()
c. Setting conditions
d. Adding a new column

7. Perform following operations using pandas
   a. Filling NaN with string
   b. Sorting based on column values
   c. groupby()
8. Read the following file formats using pandas
   a. Text files
   b. CSV files
   c. Excel files
   d. JSON files
9. Read the following file formats
   a. Pickle files
   b. Image files using PIL
   c. Multiple files using Glob
   d. Importing data from database
10. Demonstrate web scraping using python
11. Perform following preprocessing techniques on loan prediction dataset
   a. Feature Scaling
   b. Feature Standardization
   c. Label Encoding
   d. One Hot Encoding
12. Perform following visualizations using matplot lib
   a. Bar Graph
   b. Pie Chart
   c. Box Plot
   d. Histogram
   e. Line Chart and Subplots
   f. Scatter Plot

13. Getting started with NLTK, install NLTK using PIP
14. Python program to implement with Python SciKit- Learn & NLTK
15. Python program to implement with Python NLTK/ Spicy/ PyNLPI.

Web References:

1. https://www.analyticsvidhya.com/blog/2020/04/the-ultimate-numpy-tutorial-for-data-science-beginners/
2. https://www.analyticsvidhya.com/blog/2021/07/data-science-with-pandas-2-minutes-guide-to-key-concepts/
3. https://www.analyticsvidhya.com/blog/2020/04/how-to-read-common-file-formats-python/
4. https://www.analyticsvidhya.com/blog/2016/07/practical-guide-data-preprocessing-python-scikit-learn/
5. https://www.analyticsvidhya.com/blog/2020/02/beginner-guide-matplotlib-data-visualization-exploration-python/6.
6. https://www.nltk.org/book/ch01.html

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - II Semester	Course Code: BT24CS2206	L	T	P	C
		0	1	2	2
FULL STACK DEVELOPMENT – 1 **(Skill Enhancement Course)**					

Course Objectives:

The main objectives of the course are to

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

Course Outcomes:

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

CO1: Make use of HTML elements (L3)

CO2: Use attributes for designing static web pages (L3).

CO3: Build a web page by applying appropriate CSS styles (L4).

CO4: Build a web page by applying appropriate HTML elements (L4).

CO5: Experiment with JavaScript to develop dynamic web pages (L4).

CO6: Experiment with JavaScript to develop validate forms (L4).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2.00	3.00	-	2.00	-	-	-	-	-	-	-	-
CO2	2.00	3.00	3.00	3.00	-	-	-	-	-	-	-	-
CO3	2.00	3.00	3.00	2.00	3.00	-	-	-	-	-	-	-
CO4	2.00	3.00	3.00	3.00	2.00	-	-	-	-	-	-	-
CO5	2.00	3.00	3.00	2.00	2.00	-	-	-	-	-	-	-
CO6	2.00	2.00	3.00	2.00	2.00	-	-	-	-	-	-	-

	PSO1	PSO2
CO1	-	2.00
CO2	-	-
CO3	-	-
CO4	2.00	-
CO5	2.00	-
CO6	-	-

Experiments covering the Topics:

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

Sample Experiments:

1. **Lists ,Links and Images**

a. Write a HTML program, to explain the working of lists.

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

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

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

d. Write a HTML program, in such away 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 liketo100*100pixels. 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**

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

- 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 webpage.

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

4. Selector forms

a. Write a program to apply different types of selector forms

- Simple selector(element, id, class, group, universal)
- Combinator selector (descendant, child, adjacent sibling, general sibling)
- Pseudo- class selector
- Pseudo- element selector
- Attribute selector

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

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

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

c. Write a program using the following terms related to CSS font and text:

i. font -size ii. font- weight iii. font- style

iv. text- decoration v .text- transformation vi. text- alignment

d. Write a program , to explain the importance of CSS Box model using

i.Content ii. Border iii. Margin iv. padding

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

a. Write a program to embed internal and external JavaScript in a webpage.

b. Write a program to explain the different ways ford is playing output.

c. Write a program to explain the different ways for taking input.

d. Create a webpage which uses prompt dialogue box to ask a voter for his name and

age. Display the information in table format along with either the voter can vote or not

7. JavaScript Pre- defined and User- defined Objects

a. Write a program using document object properties and methods.

b. Write a program using window object properties and methods.

c. Write a program using array object properties and methods.

d. Write a program using math object properties and methods.

e. Write a program using string object properties and methods.

f. Write a program using regex object properties and methods.

g. Write a program using date object properties and methods.

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

8. JavaScript Conditional Statements and Loops

a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".

b. Write a program to display week days using switch case.

c. Write a program to print 1to10 numbers using for, while and do- while loops.

d. Write a program to print data in object using for-in ,for-each and for- of loops

e. Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e.,13 + 53+ 33 = 153]

f. Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's. (Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1- 10's, 1-2's & 1-1's)

9. JavaScript Functions and Events

a. Design a appropriate function should be called to display

- Factorial of that number
- Fibonacci series up to that number
- Prime numbers up to that number
- Is it palindrome or not

b. Design a HTML having a text box and four buttons named Factorial, Fibonacci,

Prime, and Palindrome. When a button is pressed an appropriate function should be called to display

1. Factorial of that number
2. Fibonacci series up to that number
3. Prime numbers up to that number
4. Is it palindrome or not

c. Write a program to valid ate 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(onlynumbersandlength10digits)

iii. E-mail(shouldcontainformatlikexxxxxxx@xxxxxx.xxx)

Text Books:

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

Web Links:

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

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

II Year - II Semester	Course Code: BT24ME2207	L	T	P	C
		1	0	2	2
DESIGN THINKING & INNOVATION					

Course Objectives: The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and converting to demand.
- Introduce product planning and product development process.

Course Outcomes:

CO1: Apply the concepts related to design thinking in real-world scenarios (L3)

CO2: Analyze the fundamentals of Design Thinking and its role in innovation (L4)

CO3: Develop design thinking techniques to solve complex problems across various industries (L5)

CO4: Assess the effectiveness of working in a multidisciplinary environment for product innovation (L5)

CO5: Evaluate the impact of creativity and innovation on business and product development (L6)

CO6: Create innovative solutions by integrating design thinking into business processes and entrepreneurship (L6).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3.00	-	2.00	2.00	-	2.00	-	2.00	3.00	2.00	-	2.00
CO2	3.00	-	2.00	2.00	-	2.00	-	2.00	3.00	2.00	-	2.00
CO3	3.00	-	2.00	2.00	-	2.00	-	2.00	3.00	2.00	-	2.00
CO4	3.00	-	2.00	2.00	-	2.00	-	2.00	3.00	2.00	-	2.00
CO5	3.00	-	2.00	2.00	-	2.00	-	2.00	3.00	2.00	-	2.00
CO6	3.00	-	2.00	2.00	-	2.00	-	2.00	3.00	2.00	-	2.00

	PSO1	PSO2
CO1	3.00	-
CO2	3.00	-
CO3	3.00	-
CO4	3.00	-
CO5	3.00	-
CO6	3.00	-

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.

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 Start ups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

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

Textbooks:

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

Reference Books:

1. David Lee, Design ThinkingintheClassroom,Ulyssespress,2018.
2. Shrrutin N Shetty,Designthe Future,1/e,NortonPress,2018.
3. Willia mlid well, Kritina holden, & Jill butter, Universal principlesofdesign,2/e, Rockport Publishers, 2010.
4. Chess brough. H, Theera of open innovation, 2003.

Online Learning Resources:

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

Website: www.jntuk.edu.in
E-mail: registrar@jntuk.edu.in

Phone: Off. 0884-2300906
Fax: 0884-2300901

PROCEEDINGS OF THE
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
Kakinada-533003, Andhra Pradesh (India)

Proc. No. JNTUK/DAP/Evaluation Procedure for DT&I/Approval/2025 Date: 27.01.2025

Sub: DAP – Academic Planning – Evaluation Procedure for Design Thinking and Innovation (L-T-P-C) (1-0-2-2) - Orders - Issued.

Read: e-Office No. 2690537 approved by Honourable Vice Chancellor dated 27.01.2025

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ORDER:

With reference cited above, the Honorable Vice Chancellor, JNTUK is pleased to approve the recommendations for Evaluation Procedure for Design Thinking and Innovation (L-T-P-C) (1-0-2-2) as follows:

- **Evaluation Procedure for Design Thinking and Innovation (L-T-P-C) (1-0-2-2):**

The performance of a student **for Design Thinking and Innovation** shall be evaluated with a maximum of 100 marks.
A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester and end examination marks taken together.

Assessment Method	Marks
Internal Assessment	30
Semester End Examination	70
Total	**100**

The distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.

a) Internal Evaluation Procedure

i) **Of the internal marks of 30, Day to Day Evaluation in the lab will be given a maximum of 7.5 Marks (25%) and Mid Exam(theory), a maximum of 22.5 Marks (75%).**

ii) During the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment. **30 Marks will be scaled down to 22.5 Marks.**

a. Objective paper shall contain for 05 short answer questions with 2 marks each OR maximum of 20 bits for 10 marks.
b. Subjective paper shall contain 3 questions of internal choice (i.e., either-or type questions of which student has to answer one from each either-or type of questions, each question carries 10 marks. The marks obtained in the subjective paper are condensed to 15 marks.
c. 5 marks for assignment
d. Mid examinations of Design thinking and Innovation to be conducted by the corresponding college.

Note:

- The subjective paper shall contain 3 either-or type questions of equal weightage of 10 marks. Any fraction shall be rounded off to the next higher mark.
- Assignments shall be in the form of problems, mini projects, design problems, slip tests, quizzes etc., depending on the course content. It should be continuous assessment throughout the semester and the average marks shall be considered.

iii) If the student is absent for the mid semester examination, no re-exam shall be conducted and mid semester marks for that examination shall be considered as zero.

iv) First midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.

v) Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

vi) If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other.

b) End Examination (Only Practical's) Evaluation:

The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.

- Procedure: 20 marks
- Experimental work & Results: 30 marks
- Viva voce: 20 marks.

REGISTRAR
REGISTRAR
J.N.T. University Kakinada
Kakinada-533003.

To
The Director of Evaluation, JNTUK Kakinada.
Copy to the Director, Academic Planning, JNTUK Kakinada.
Copy to the Secretary to Hon'ble Vice-Chancellor, JNTUK Kakinada.
Copy to the PA to the Registrar, JNTUK Kakinada.