

w.e.f. 2023-24

D. 123

**B. Tech.**  
**INFORMATION TECHNOLOGY**  
**(B.Tech 2<sup>nd</sup> Year Syllabus)**

**Department of Information Technology**



**DHANEKULA INSTITUTE OF  
ENGINEERING & TECHNOLOGY**

**(AUTONOMOUS)**

**(Approved by AICTE, Accredited by NBA (EEE|ME|ECE|CSE),**


**Affiliated to JNTUK, Kakinada)**

**Ganguru, Vijayawada**

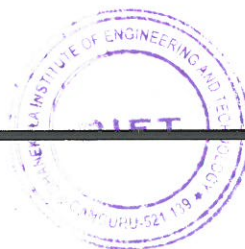
**Andhra Pradesh - 521139,**

**INDIA.**

**[www.diet.ac.in](http://www.diet.ac.in)**

  
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Principal  
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**DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY**  
(Autonomous)

GANGURU :: VIJAYAWADA – 521 139.

(Approved by AICTE New Delhi, Permanently Affiliated to JNTU Kakinada)  
ISO 9001:2015 Certified Institution, Accredited by NBA for ME, EEE, ECE & CSE.

**DEPARTMENT OF INFORMATION TECHNOLOGY**

<b>Institute Vision</b>	Pioneering Professional Education through Quality
<b>Institute Mission</b>	<p>Providing Quality Education through state-of-art infrastructure, laboratories and committed staff.</p> <p>Moulding Students as proficient, competent, and socially responsible engineering personnel with ingenious intellect.</p> <p>Involving faculty members and students in research and development works for betterment of society.</p>
<b>Department Vision</b>	To become a leading center in Information Technology education and research, fostering innovation, technical expertise, and responsibility
<b>Department Mission</b>	<ul style="list-style-type: none"><li>• Provide learner centric education with state-of-the-art facilities.</li><li>• Impart problem-solving skills to become pioneers in the global competition through training and various activities.</li><li>• Equip learners with employability and entrepreneurial skills.</li><li>• Promote Research environment and inculcate corporate social responsibility.</li></ul>
<b>Program Educational Objectives (PEOs)</b>	<p>Graduates of Information technology will:</p> <p>PEO1: Solve multidisciplinary problems and innovate through core IT knowledge, excelling in professional careers or higher studies.</p> <p>PEO2: Integrate IT across domains, demonstrate ethical professionalism, and embody environmental consciousness as competent, well-rounded individuals.</p> <p>PEO3: Engage in continuous learning, adapting to evolving technologies while promoting societal betterment through responsible innovation and research.</p>

Head of the Department



**DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY**  
**DEPARTMENT OF INFORMATION TECHNOLOGY**  
**Program Outcomes (PO's)/ Program Specific Outcomes (PSO's)**

**Program Outcomes**

1	<b>Engineering Knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	<b>Design/development of solutions:</b> 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	<b>Conduct investigations of complex problems:</b> 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	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	<b>Engineer and society:</b> 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	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	<b>Individual and teamwork:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	<b>Communication:</b> 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	<b>Project management and finance:</b> 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	<b>Life-long learning:</b> 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**

PSO1: Design and develop Information Technology based AI systems and software applications with technical and professional skills.

PSO2: Excel in higher studies, secure employment in diverse technology sectors, contribute to research, and entrepreneurship.

**Annexure-I**


**B. Tech.–II Year I Semester**

S. No.	Category	Title	L	T	P	Credits
1	BS&H	Discrete Mathematics & Graph Theory	3	0	0	3
2	BS&H	Universal human values - understanding harmony and Ethical human conduct	2	1	0	3
3	Engineering Science	Digital Logic & Computer Organization	3	0	0	3
4	Professional Core	Advanced Data Structures & Algorithms	3	0	0	3
5	Professional Core	Object Oriented Programming Through Java	3	0	0	3
6	Professional Core	Advanced Data Structures Lab	0	0	3	1.5
7	Professional Core	Object Oriented Programming Through Java Lab	0	0	3	1.5
8	Skill Enhancement course	Python Programming	0	1	2	2
9	Audit Course	Environmental Science	2	0	0	-
<b>Total</b>			<b>16</b>	<b>2</b>	<b>8</b>	<b>20</b>

**B. Tech.–II Year II Semester**

S. No.	Category	Title	L	T	P	Credits
1	Management Course- I	Optimization Techniques	2	0	0	2
2	Engineering Science/ Basic Science	Probability & Statistics	3	0	0	3
3	Professional Core	Operating Systems	3	0	0	3
4	Professional Core	Database Management Systems	3	0	0	3
5	Professional Core	Software Engineering	3	0	0	3
6	Professional Core	Operating Systems & Software Engineering Lab	0	0	3	1.5
7	Professional Core	Database Management Systems Lab	0	0	3	1.5
8	Skill Enhancement Course	1. Python with Django(or) 2. Full Stack Development – I	0	1	2	2
9	BS&H	Design Thinking & Innovation(or) <a href="https://onlinecourses.swayam2.ac.in/aic23_ge17/preview">https://onlinecourses.swayam2.ac.in/aic23_ge17/preview</a>	1	0	2	2
<b>Total</b>			<b>15</b>	<b>1</b>	<b>10</b>	<b>21</b>

Mandatory Community Service Project Internship of 08 weeks duration during summer vacation

  
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# II-I Semester



**DISCRETE MATHEMATICS AND GRAPH THEORY**

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

**Course Outcomes:**

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

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

Note: K-Level is defined From Blooms Taxonomy

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

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

**COURSE CONTENT:**

**UNIT-I: Mathematical Logic**

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

**UNIT-II: Set Theory**

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

**UNIT-III: Combinatorics and Recurrence Relations**

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

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

#### UNIT-IV: Graph Theory

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

#### UNIT-V: Multi Graphs

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

#### Text Books:

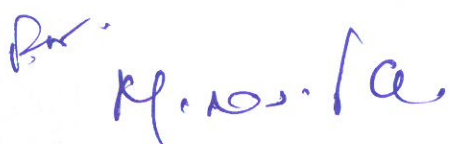
1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill, 2002
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill, 2011
3. Theory and Problems of Discrete Mathematics,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

#### Reference Books:

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

#### E-Resources:

1. [Discrete Mathematics - Course \(nptel.ac.in\)](http://nptel.ac.in)
2. [Graph Theory - Course \(nptel.ac.in\)](http://nptel.ac.in)
3. [Graph theory in Discrete Mathematics - javatpoint](http://javatpoint)
4. [Discrete Mathematics Tutorial - GeeksforGeeks](http://GeeksforGeeks)
5. [DISCRETE MATHEMATICS AND GRAPH THEORY - PURNA CHANDRA BISWAL - Google Books](https://www.google.com/books)
6. [mth202.pdf \(iitk.ac.in\)](http://iitk.ac.in)





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**UNIVERSIAL HUMAN VALUES -2 UNDERSTANDING  
HARMONY & ETHICAL HUMAN CONDUCT**

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

**Course Outcomes:**

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

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

Note: K-Level is defined From Blooms Taxonomy

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

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

**COURSE CONTENT:**

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

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

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

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


Lecture 2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself

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

Lecture 4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

  
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Lecture 5: Happiness and Prosperity – Current Scenario  
Lecture 6: Method to Fulfill the Basic Human Aspirations  
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

**UNIT-II: Harmony in the Human Being (6 lectures and 3 tutorials for practice session)**

Lecture 7: Understanding Human being as the Co-existence of the self and the body.  
Lecture 8: Distinguishing between the Needs of the self and the body  
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.  
Lecture 9: The body as an Instrument of the self  
Lecture 10: Understanding Harmony in the self  
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self  
Lecture 11: Harmony of the self with the body  
Lecture 12: Programme to ensure self-regulation and Health  
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body .

**UNIT-III: Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)**

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction  
Lecture 14: 'Trust' – the Foundational Value in Relationship  
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust  
Lecture 15: 'Respect' – as the Right Evaluation  
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect  
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship  
Lecture 17: Understanding Harmony in the Society  
Lecture 18: Vision for the Universal Human Order  
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

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


Lecture 19: Understanding Harmony in the Nature  
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature  
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature  
Lecture 21: Realizing Existence as Co-existence at All Levels  
Lecture 22: The Holistic Perception of Harmony in Existence  
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

**UNIT-V: Implications of the Holistic Understanding -- a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)**

Lecture 23: Natural Acceptance of Human Values  
Lecture 24: Definitiveness of (Ethical) Human Conduct  
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct  
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order  
Lecture 26: Competence in Professional Ethics  
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education  
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies  
Lecture 28: Strategies for Transition towards Value-based Life and Profession  
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

**Practice Sessions for UNIT-I -- Introduction to Value Education**

PS1 Sharing about Oneself

  
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PS2 Exploring Human Consciousness  
PS3 Exploring Natural Acceptance

**Practice Sessions for UNIT-II – Harmony in the Human Being**

PS4 Exploring the difference of Needs of self and body  
PS5 Exploring Sources of Imagination in the self  
PS6 Exploring Harmony of self with the body

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

PS7 Exploring the Feeling of Trust  
PS8 Exploring the Feeling of Respect  
PS9 Exploring Systems to fulfil Human Goal Practice Sessions for

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

PS10 Exploring the Four Orders of Nature  
PS11 Exploring Co-existence in Existence Practice Sessions for

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

PS12 Exploring Ethical Human Conduct  
PS13 Exploring Humanistic Models in Education  
PS14 Exploring Steps of Transition towards Universal Human Order

**Mode of Conduct:**

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

Tutorial hours are to be used for practice sessions.

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


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

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

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

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

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

  
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## Readings: Text Book and Teachers Manual

### a. The Textbook

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

### b. The Teacher's Manual

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

## Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

## Online Resources:

1. <https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf>
2. <https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf>
3. <https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf>
4. <https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20 July%202023.pdf>
5. <https://fdp-si.aicte-india.org/UHVII%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf>
6. <https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDPSI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf>
7. <https://fdp-si.aicteindia.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf>
8. <https://www.studocu.com/in/document/kiet-group-of-institutions/universal-humanvalues/Chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385>  
[https://onlinecourses.swayam2.ac.in/aic22\\_ge23/preview](https://onlinecourses.swayam2.ac.in/aic22_ge23/preview)

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## ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS

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

### Course Outcomes:

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

Note: K-Level is defined From Blooms Taxonomy

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

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

### COURSE CONTENT:

#### UNIT-I:

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.  
AVL 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 Biconnected Components, applications.  
Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication.

#### UNIT-III:

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

Optimal Binary Search Trees.s

Dynamic Programming I: General Method, all pairs shortest paths.

#### UNIT-IV:

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

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

#### UNIT-V:

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

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem (without proof) NP Hard

Graph Problems: Clique Decision Problem (CDP), Traveling Salesperson Decision Problem (TSP)

NP Hard Scheduling Problems: Job Shop Scheduling

#### Textbooks:


1. Fundamentals of Data Structures in C++, HorowitzEllis, SahniSartaj, MehtaDinesh, 2ndEdition, Universities Press, 2008.
2. Computer Algorithms in C++, Ellis Horowitz, SartajSahni, Sanguthevar Rajasekaran, 2<sup>nd</sup> Edition, University Press, 2008.

#### Reference Books:

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

#### E-Resources:

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

  
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## OBJECT ORIENTED PROGRAMMING THROUGH JAVA

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

### Course Outcomes:

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

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

Note: K-Level is defined From Blooms Taxonomy

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

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

### COURSE CONTENT:

#### UNIT-I: Object Oriented Programming

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

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

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

## UNIT-II:

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

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

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

## UNIT-III:

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

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

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

## UNIT-IV:

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

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

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

## UNIT-V:

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

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

## Textbooks:

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

**Reference Books:**

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

**E-Resources/Digital Material:**

1. <https://nptel.ac.in/courses/106/105/106105191/>
2. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_012880464547618816347\\_s\\_hared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_s_hared/overview)



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**ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB**

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

**Course Outcomes:**

After Successful Completion of course, the student will be able to:		
CO No:	Course Outcome Description	K - Level
CO1	Implement data structures like AVL Trees, Heap Tree and Graphs	Applying
CO2	Solve problems using different algorithmic approaches like Divide and Conquer, Greedy method, Dynamic Programming and Backtracking	Applying

Note: K-Level is defined From Blooms Taxonomy

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

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

**COURSE CONTENT:**

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

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**Text Books:**

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

**Reference Books:**

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

**E-Resources/Digital Material:**

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



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**OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB**

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

**Course Outcomes:**

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

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

Note: K-Level is defined From Blooms Taxonomy

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

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

**COURSE CONTENT:**

**Exercise - 1**

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

**Exercise - 2**

- Write a JAVA program to search for an element in a given list of elements using binary search Mechanism.
- Write a JAVA program to sort for an element in a given list of elements using bubble sort.
- Write a JAVA program using String Buffer to delete and remove characters.

**Exercise - 3**

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

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**Exercise - 4**

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

**Exercise - 5**

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

**Exercise - 6**

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

**Exercise - 7**

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

**Exercise – 8**

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

**TEXTBOOKS:**

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

**REFERENCE BOOKS:**

1. The complete Reference Java, Herbert Schildt, 11<sup>th</sup>Edition, TMH, 2017.
2. Introduction to Java Programming, Y Daniel Liang, 7<sup>th</sup> Edition, Pearson, 2012.

**E-RESOURCES/DIGITAL MATERIAL:**

1. <https://nptel.ac.in/courses/106/105/106105191/>
2. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_01288046454\\_7618816347\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046454_7618816347_shared/overview)
3. [https://www.youtube.com/watch?v=3b-Wprhc\\_P8&list=PLsyeobzWxl7qcjd9Cx7W7ViDQk9TcfUIQs](https://www.youtube.com/watch?v=3b-Wprhc_P8&list=PLsyeobzWxl7qcjd9Cx7W7ViDQk9TcfUIQs)

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## PYTHON PROGRAMMING

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

### Course Outcomes:

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

Note: K-Level is defined From Blooms Taxonomy

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

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

### COURSE CONTENT:

#### UNIT-I:

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

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

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Typed Language.

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

**Sample Experiments:**

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Write a program to add and multiply complex numbers
5. Write a program to print multiplication table of a given number.

**UNIT-II:**

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

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

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

**Sample Experiments:**

1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. 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

**UNIT-III:**

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

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

**Sample Experiments:**

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

**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 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 basic slicing, integer and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of array.
6. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
  - a) Apply head () function to the pandas data frame
  - b) Perform various data selection operations on Data Frame
- 5 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.

#### Textbooks:


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

#### Reference Books:

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

#### E-Resources/Digital Material:

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

  
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## ENVIRONMENTAL SCIENCE



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

### Course Outcomes:

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

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

Note: K-Level is defined From Blooms Taxonomy

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

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

### COURSE CONTENT:

#### 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:

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## UNIT-II:

Ecosystems: Concept to fan 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. Grassl and ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Biodiversity

And Its Conservation: Introduction Definition: genetic, species and ecosystem diversity–Bio-geographical classification of India–Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-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, rainwater harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions–Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wastel and 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 environment 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, hills lopes, etc..

**Text Books:**

1. Text book of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palani swamy, "Environmental Studies", Pearson education.
3. S.AzeemUnnisa, "Environmental Studies" Academic Publishing Company
4. K.RaghavanNambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt.Ltd

**Reference Books:**

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

**E-Resources:**

1. [https://onlinecourses.nptel.ac.in/noc23\\_hs155/preview](https://onlinecourses.nptel.ac.in/noc23_hs155/preview)
2. <https://archive.nptel.ac.in/courses/120/108/120108004/>
3. [https://onlinecourses.nptel.ac.in/noc24\\_ge19/preview](https://onlinecourses.nptel.ac.in/noc24_ge19/preview)
4. [https://onlinecourses.swayam2.ac.in/cec19\\_bt03/preview](https://onlinecourses.swayam2.ac.in/cec19_bt03/preview)
5. <https://www.classcentral.com/course/swayam-environmental-science-184135>



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